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Europe Report

SCIENCE AND TECHNOLOGY

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EUROPE REPORT

SCIENCE AND TECHNOLOGY

WEST EUROPE

COMPUTERS

ECRD Project of Bull, ICL, Siemens Explained
(ZERO UN INFORMATIQUE, 17 Mar 86) 1

LASERS, SENSORS, AND OPTICS

French Laser in 7 to 10 kw Range Developed
(Michel Defaux; L'USINE NOUVELLE, 20 Mar 86).............. 3

SCIENTIFIC AND INDUSTRIAL POLICY

Italy Establishes Law on State Subsidies of Private Research
(GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA, 27 Feb 86). 5

EAST EUROPE

AEROSPACE

Hungarian Instruments in Vega Program
(Nandor Mester Interview; NEPSZAVA, 19 Mar 86)............ 7

BIOTECHNOLOGY

Institute Director Discusses Polish Biotechnology Developments
(Wieslaw Rzedowski Interview; ZYCIE GOSPODARCZE,
6 Apr 85)... 11

Romania Develops Textiles for Medical Implantation
(Aristide Dodu, et. al.; INDUSTRIA USOARA, No 12, Dec 85). 19

COMPUTERS

Overview of Distributed Intelligence Process Control Systems
(Istvan Vaskovi; MERES ES AUTOMATIKA, No 6, 1985)......... 24

Hungarian Software Engineering Described
(Zsolt Varkonyi; INFORMACIO ELEKTRONIKA, No 6, 1984)...... 28

FACTORY AUTOMATION

Overview of Hungarian Robotics Efforts
(Zsuzsa Szentgyorgyi; IMPULZUS, No 8, Mar 86)............. 36

LASERS, SENSORS, OPTICS

Laser Developments in Bulgaria Described
(Andrey Nedyalkov, Paun Tsonev; OTECHESTVEN FRONT, 5 Apr 86).. 46

METALLURGICAL INDUSTRIES

Romanian Commentary on GDR Powder Metallurgy Conference
(P. Herscovici; METALURGIA, No 38, Jan 86)................ 49

SCIENTIFIC AND INDUSTRIAL POLICY

Policy, Strategy of Bulgarian Science Academy
(Boris Bradinov; SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE, No 6, 1985)...................................... 53

Director Discusses Activities of GDR Nuclear Institute
(Guenter Flach Interview; SPECTRUM, No 1, 1986)........... 60

Hungarian Academy of Sciences President on Plans, Principles
(Ivan I. Berend Interview; MAGYAR TUDOMANY, No 3, Mar 86). 66

Investments of Institutions Under Hungarian Academy of Sciences
(AKADEMIAI KOZLONY, 19 Mar 86)............................ 75

Role, Make-up of Hungarian Science Policy Committee
(AKADEMIAI KOZLONY, 19 Mar 86)............................ 78

Role of Hungarian Technical Development Committee Expanded
(Laszlo Mohacsi Interview; OTLET, 20 Mar 86).............. 80

/12675

WEST EUROPE/COMPUTERS

ECRD PROJECT OF BULL, ICL, SIEMENS EXPLAINED

Paris ZERO UN INFORMATIQUE in French 17 Mar 86 p 69

[Article: "A Menage a Trois, Munich's ECRC: Bull, ICL, and Siemens"; first paragraph is ZERO UN INFORMATIQUE HEBDO introduction]

[Text] In 1984, Bull, ICL [International Computers Limited], and Siemens established ECRC (European Computer Research Center), a joint research center.

Siemens of Germany provides ECRC with its location in Munich, the British firm ICL offers its official language, and the French company Bull provides its director, Herve Gallaire. Tenured at Berkeley and at ONERA [National Office for Aerospace Studies and Research], Herve Gallaire created the Marcoussis data processing laboratory for CGE [General Electric Company] in 1980. He is the father of the MAIA (Applied Artificial Intelligence Machine) project. In 1984 he joined Bull with the express purpose of taking personal control of the newly established ECRC's fate.

At present ECRC has approximately 10 administrators and 40 researchers in Munich, of whom about 30 have been released [to ECRC] by the charter companies for a 3-year period. The rest were either recruited directly by the ECRC or were employed at government laboratories (as was the case with two people).

Established as a company under German law with an initial capital of DM1.8 million, the ECRC has an annual budget of approximately DM20 million financed equitably by Bull, ICL, and Siemens.

ECRC operates under the direction of a six-member committee (two representatives per company) to which must be added Herve Gallaire himself as well as a president who also serves on the board of directors. Once every 3 months the committee meets to decide on projects to launch.

These precompetitive research projects must belong to one of the following four fields (all associated with computer-aided decision systems): programming languages, knowledge bases, man-machine interfaces, or architectures.

Ten projects are currently under way. They are specifically geared toward programming environment (a Prolog compiler was presented last month), object-oriented languages, and constraint programming. In the area of knowledge bases there is a large project involving the establishment of an "intelligent"

and relational deductive database. Regarding interfaces, certain results have already been obtained in graphics and semantic user aids.

Collaboration Leads to a Highly Invigorating Emulation

As to hardware, ECRC obviously has Bull, ICL, and Siemens machines, but also DEC hardware and a LISP [List Processing] machine, all operating under Unix.

Hevre Gallaire views the overall situation as positive: "We are under external pressure from our founders to produce results and this is very stimulating. Everything moves much faster, and we have never experienced the least problem with internal collaboration."

ECRC projects do not lead directly to development: each partner is free to use the results within his company as he pleases. Beyond that, commercial agreements would have to be prepared. For the moment there is no link at all between ECRC and ESPRIT, but Herve Gallaire has declared himself to be quite open on this subject.

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WEST EUROPE/LASERS, SENSORS, AND OPTICS

FRENCH LASER IN 7 TO 10 KW RANGE DEVELOPED

Paris L'USINE NOUVELLE in French 20 Mar 86 p 47

[Article by Michel Defaux: "The First French 7-kw Laser"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Besides completing the series, the development of this 7-kw laser using a new technology also constitutes a key component in CGE's [General Electric Company] optoelectronics and factory automation plans.

"In 1 year our engineers have succeeded in developing a laser which presently generates 7 kw of power." The satisfaction of J.-P. Hauet, chief executive officer, is understandable; this instrument will soon complete Cilas-Alcatel's series of 1-kw, 2-kw and 4-kw lasers.

That is extremely rapid development, as it was only in 1984 that the CGE Marcoussis laboratories, together with Alsthom and Cilas-Alcatel and in cooperation with EDF [French Electricity Company], undertook the development of a prototype using a compact gas-circulation device. Assembled in 1985, this experimental version emitted its first laser beam at the beginning of this year. With a stable multi-mode cavity, it produced 7 kw beginning with the first trial runs. These experiments will continue until June to test the reliability of the components and to improve the quality of the beam using so-called unstable optical cavities. "Thus we hope to reach 10 kw, a capacity that will make this laser the absolute leader in Europe."

In September, this instrument will be connected to a laser machining center where initial research will be done on welding and surface treatment of metals and ceramics. Such power, for instance, makes it possible to weld plates of considerable thickness (10 mm) and allows treatments such as hardening, annealing, and surface alloy deposition, the advantages being good beam accessibility and smaller affected zones.

A second prototype will be ready for laboratories and test centers in early 1987: "After the initial tests we have confidence that we could meet a possible demand for 20-kw equipment." For an industrial product, i.e., adapted to use in a workshop (environmental resistance, reliability), we will have to wait until the end of 1988.

A 4-Year Laser Robot Project

The development of this laser constitutes a key component in CGE's plans for optoelectronics and factory automation. Thus, this instrument could be integrated into the national research program on the laser of the future (ROFL).

This 4-year project (total budget of Fr 50 million), whose specifications are almost ready, concerns a laser robot: the 10-kw laser will be mounted vertically on the frame and the beam will be guided by the robot's head which will be controlled by on-board sensors. This laser will also contribute to different projects of the EUREKA program, in particular to EUROLASER (development of 20-kw or more with our German neighbors), and to the flexible optoelectronic workshop.

In order to facilitate the necessary link between research and industry, Cilas-Alcatel, which together with SORO and BBT [Barbier, Benard, and Turenne Company] owns eight facilities in France, will combine them all at Marcoussis in March 1987 and will then own only two factories: one in Orleans (military), the other currently being built at Florange in Lorraine (civil lasers).

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WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ITALY ESTABLISHES LAW ON STATE SUBSIDIES OF PRIVATE RESEARCH

[Editorial Report] Rome GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA in Italian on 27 February 1986 publishes on pages 280-281 Law No 46 on the "interventions in the economic sectors of national importance," adopted by the Italian Parliament on 17 February 1982. In discussing the procedures by which Italian companies may qualify for participation in the "special revolving fund for technological innovations," Law No. 46 states:

"Article 14

The "special rotating fund for technological innovations" has been established in the Ministry of Industry, Commerce and Crafts. The fund is managed out of a budget in accordance with Article 9 of Law No 1041 of 25 November 1971.

The participation of company programs in the fund is designed to introduce remarkable technological advances for new products or production processes or for improvements to products or existing production processes. Considered as a whole, such programs concern design, experimentation, development, and preindustrialization.

CIPI defines the eligibility conditions for fund participation within 30 days of the effective date of the law. It also indicates their priority considering the general requirements of the national economy and determines the criteria for the formalities of the preliminary investigation."

"Article 16

The requests for the concession of funds, together with the related schedules, will be submitted to the Minister of Industry, Commerce and Crafts, who provides for the relevant investigations, according to the procedures decreed by CIPI.

The granting of funds described in the preceding Article 14 is decided by the Minister of Industry, Commerce and Crafts, acting on the recommendation of the technical committee comprised of those members identified in Paragraph 6, Article 4 of Law No 675--August 12, 1977; a representative appointed by the Minister of Government Holdings; and of five experts highly specialized in industrial production-related science and technology, chosen by the Minister of Industry, Commerce and Crafts, in agreement with the Minister for

Scientific and Technological Research. The Interministerial Committee for the Coordination of Industrial Policy [CIPI] defines the entity, the conditions and the procedures of the funds, and establishes any specific clauses which are to be included in the contract as stated in the following paragraph.

Following CIPI resolutions, a contract is drawn up between the Minister of Industry, Commerce and Crafts and the company, and is exempt from the provisions on the State's administration of assets and general accounting. The contract specifies the obligations of the company in order of objectives, time schedules, and procedures for program completion, as well as the company's achievements, cost estimates, eventual participation of other companies (also foreign) in the program, the amount and the conditions of the fund, the revocation or the suspension of the fund or the application of penalties in the case of nonfulfillment of the agreement.

The company is obliged to attach a statement to the contract, attesting that it is not using nor has requested the funds as stipulated in Law 1089--October 1968, and Law No 675--August 12, 1977, and successive alterations and additions, for programs with the same objective aims.

The modalities, times, and procedures necessary for the presentation of the request with related documentation and for the disbursement of the funds are established by a decree issued by the Minister of Industry, Commerce and Crafts, together with the Minister for Scientific and Technological Research.

Financial obligations are undertaken by the Minister of Industry, Commerce and Crafts.

Demand for payment will be issued and signed by the Minister of Industry, Commerce and Crafts, or a deputy.

In the case of total or partial noncompletion of the program, the Minister of Industry, Commerce and Crafts, acting upon the recommendations of the committee referred to in the second paragraph of this article, may revoke the provision for this loan, and the company is obliged to return in total the remaining sum of the fund, or may arrange for the cancellation of 50 percent of the remaining credit.

In the case of minor default, the Minister of Industry, Commerce and Crafts, upon the recommendation of the committee referred to in the second paragraph of this article, may order the suspension of the fund or the application of the penalties provided for in the contract."

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EAST EUROPE/ AEROSPACE

HUNGARIAN INSTRUMENTS IN VEGA PROGRAM

Budapest NEPSZAVA in Hungarian 19 Mar 86 p 7

[Interview by Nandor Mester: "Exciting Success of Hungarian Instruments in Space. Conversation About the Vega Program in a Hungarian Laboratory"]

[Text] The Vega program is an international undertaking in which researchers from the Soviet Union, Hungary, Bulgaria, Czechoslovakia, the GDR, Poland, France, and America have participated, or are participating. The development work on the instruments produced in Hungary was coordinated by the Central Physics Research Institute. Research was conducted and the finished instruments were examined by the departments of the Technical University of Budapest, the Astronomical Research Institute of the MTA, the Geological Survey Institute, and the Budapest Planetarium of the TIT. Of the Hungarian participants, we decided to interview the members of the Technical University about the details of the exciting, multi-year project.

[Question] Is there a "Vega Connection"?

[Answer] Even before the current program--says Andras Gschwindt, an adjunct professor and head of the Microwave Department of the university--we had manufactured data-collecting systems similar to the ones currently used for the Interkosmos satellites. We have also developed several energy-distributing basic units and telemetric sender-receivers which were used on board of the same sattelites. The development of these three types of instruments was a good basis for becoming involved in the new program in 1981.

[Question] What new conditions must the instruments meet--we asked from Jozsef Szabo, a scientific assistant at the University.

[Answer] Considering that for 440 days the space probe had to traverse a completely unknown region before it arrived near the comet, a great role was played by the reliability of the system as a whole, and by the individual instruments on board. For this reason the most important consideration during work was that each unit be as reliable as possible. Because of the unknown atmospheric, materials, and energy conditions, and, because one had to adhere

strictly to size, weight and energy limitations, we had to develop and partially manufacture a special series of instruments which were never used before. The 25 members of the space research group of our department worked very precisely, checking over the various phases of work several times.

[Question] In which areas did the department do work?

[Answer] We received three partial tasks--answers Zsolt Koros, a scientific assistant. The powersources of all Hungarian instruments involved in the program were developed here. The terrestrial monitoring device was also tested here by our colleagues. We are most proud of the on-board data collecting and transmitting device which was developed and made in its entirety here.

[Question] Coming back to the extraordinary conditions, what special features did the instruments made here have?

[Answer] Most importantly, they had to work in a vacuum, which required the development of an unusual control mechanism. Another important, unique consideration was that the tolerance of the instruments for temperature and radiation near the comet had to be greater than with previous experiments. In addition, we had to cope with a medium of unknown density that required special components. By the way, the instruments were tested at temperatures between -50 and +80 degrees.

[Question] Did you use any new technology?

[Answer] No, although our efforts to increase reliability and extend life are as valuable as a new method. Let me tell you what we didn't use: microprocessors, because a single foreign particle can ruin them; instead, we incorporated only traditional TTL-gates which have normal digital circuits. These circuits work well at very low and at high temperatures.

[Question] A program as precise as the Vega cannot be implemented without components of excellent quality. Where did you get the necessary parts from?

[Answer] I must say--joined in Jozsef Szabo--that most of these did not come off the shelf. We had to follow constantly the development work of all the significant firms in the world to find the necessary pieces. Even the advanced West-Europeanand American firms have not gotten completely involved in the manufacture of special space components. Where such work is conducted, the quality may not be acceptable and, of course, the price may not be favorable for us. From Hungarian companies, we used the products of the Remix enterprise which, we can say with assurance, are world class.

[Question] Let's pause a moment at Hungarian industrial support. Can this research give a boost to the work of domestic enterprises? How can industry use this research?

[Answer] I think that utilization might be primarily in the field of the chemical industry and in that of mining, because precision and reliability are absolutely necessary there too. The data-collecting and transmitting device that we have developed is suitable for the demands of the chemical industry

and for mining. Real application must wait, however, because we have just started with the processing of the results of our research work. Of course, this does not mean that Hungarian industry cannot use the endproducts of the research that has been going on for many years. For example, we have contracts with the Long-Distance Communication Institute, Videoton, BRG and Medicor. They are our steady customers, but we gladly deliver to others: we welcome orders. After processing the data, next year we will start a continuing education program for engineers where we will discuss those results of our research which can be incorporated in the diploma projects of future engineers.

[Question] Which instrument that was developed here would you call to your students' attention?

[Answer] I would choose the most intelligent ones, the powersources. These have the unique feature of being able to decide whether they themselves, or their connected units have failed. The processed information is then sent back to the center on Earth and, what's even more important, the powersource can continue doing research even when one of its components fails.

[Question] How could you cope with the fast pace, with work that needs constant concentration?

[Answer] It happened frequently that our workdays were 30-35 hours long. Sometimes a whole day was needed for trying out a component or for performing part of an operation. Perhaps it is no exaggeration to say that only engineers who love their work and are literally possessed by it are capable of such an effort.

[Question] What are you doing now?

[Answer] Already, we are working on the Interkosmos program. Our present task is the development of even more perfect, more intelligent on-board data-collecting devices. These are entirely controlled by computers. In addition, we are continuing with the development of the standard data-collecting system for the Interkosmos countries and with the development of powersources.

Picture headings

1. A unit of the terrestrial control system
2. Dr. Zsolt Korosi observes data on the monitor
3. Sketch of the communication link

An Abbreviated Dictionary for Our Instruments

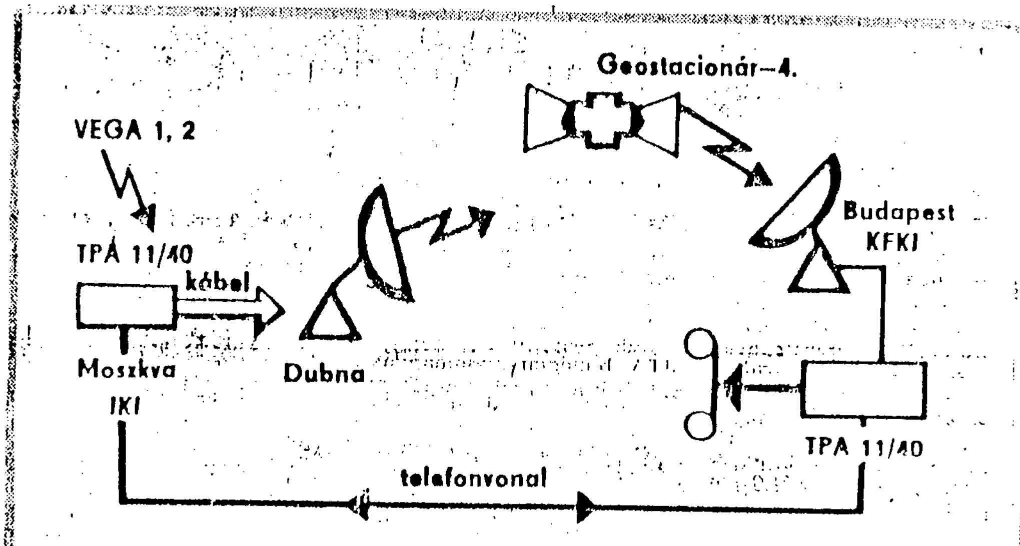
The majority of the instruments used in the Vega Program were made in the Central Physics Research Institute or were assembled there from units received from other Hungarian institutes. The instruments and systems involved are the following:

PLAZMAG: This system consists of several sensors, data processors and controllers. Its task is to measure charged particles of various energies in interplanetary space and near the comet. This is a very important task because its results can influence significantly our present knowledge of space and the comet. When near the comet, this system can clarify currently unknown details of the interaction of the planet and the plasma of the solar wind.

TUNDE: It was at the urging of Hungarian researchers that the measurement of cosmic rays was included in the program. The instrument necessary for this purpose is TUNDE which measures the cosmic radiation originating from galactic space while it is travelling in intergalactic space and near the comet, and the energy distribution of charged particles from the Sun. Its sensors collect data which are evaluated by a microprocessor-controlled data system.

ING-DUSMA: The first component, ING, made in a West German-American cooperative venture, analyzes uncharged (neutral) gas particles and the chemical composition of these gases. The second part, DUSMA, determines the distribution of cosmic dust. The contribution of the Hungarian partner was the development and building of the terrestrial control system.

TELEVISION SYSTEM: The optical and mechanical parts of the system were produced in a Soviet-French cooperative venture. The construction of the entire electronics and computer program was shared between the KFKI, the Technical University of Budapest, the astronomy department of the Eotvos University and the Astronomical Research Institute of the MTA. The assembly, adjustment, optical standardization, and control of the system was performed at the KFKI. The television system does double duty. First, acting as a space robot, by recognizing the comet and generating the appropriate signal, it directs the optical axis of the optical devices on the movable platform on the comet. Second, it takes pictures with various filters of the supposed core of the comet and its immediate surroundings, and it sends these data to evaluating stations on Earth.



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EAST EUROPE/BIOTECHNOLOGY

INSTITUTE DIRECTOR DISCUSSES POLISH BIOTECHNOLOGY DEVELOPMENTS

Warsaw ZYCIE GOSPODARCZE in Polish No 14, 6 Apr 85 p 7

[Interview with Prof Wieslaw Rzedowski, director of the Institute of the Fermentation Industry, by Anna Wieczorowska]

[Text] [Question] A trend toward biotechnology has taken over the world. There is even talk of a "biotechnological revolution."

[Answer] Biotechnology is not only a question of the current trend but also of the strategy of economic development and if in recent years it has become the object of interest of not only scientists but also of economic activists, politicians, governments and international organizations--it is due to scientific discoveries made during the mid-1970's, which opened up new vistas before this field of science. Interest in biotechnology arises from the possibility which it affords of solving many problems that burden the world, such as, obtaining new sources of energy and its more efficient use (biotechnological processes are less energy intensive than chemical processes) or the obtainment of new raw materials and the improved use of traditional raw materials, particularly in the food industry and in agriculture. The pollution, which accompanies biotechnological processes, is in many instances less dangerous to the natural environment and easier to neutralize or make further use of than chemical pollutants.

[Question] According to the definition of the European Biotechnological Federation, biotechnology is the integrated use of biochemistry, microbiology and the engineering sciences aimed at the technological utilization of the potential of microorganisms, tissue cultures or a part of them. But simply stated?

[Answer] It means the use of microorganisms in industrial processes. In the food industry--although that term [biotechnology] is not employed--it has been used for ages because the basic biotechnological processes here are fermentation, biosynthesis and biotransformation. Live cells play the role of "reactors" which transform raw materials into final products. Antibiotics, vitamins, alcohol, organic acids, enzymes, solvents, feed proteins, etc. are formed by way of fermentation. Moreover, food is processed and improved through these processes. After all, nearly 80 percent of the caloric value of food consumed by the urban population today is in the form of products which have been processed to a smaller or greater degree.

[Question] In Japan, the U.S., France, Great Britain and in Bulgaria, Czechoslovakia, Hungary and the USSR research projects subsidized by the governments of those countries are being implemented in the field of biotechnology. Do we have a program of biotechnological development?

[Answer] Thus far, there has not been such a program on a national scale. Currently, it is in the process of being implemented. Research in this field is very costly and requires expensive equipment and apparatuses, highly qualified teams of specialists from various fields and frequently, large financial outlays for implementation. This gives rise to the necessity of selecting those research programs, which because of their raw material and technical base as well as the state of the scientific and engineering-production cadre, exhibit the greatest productivity. We cannot afford to undertake research on an overly broad scale. We must select that which we need the most and which is economically justified. Therefore, we must outline a strategy for basic research and for its implementation.

[Question] Between 1986 and 1990, the Institute of the Fermentation Industry is slated to coordinate research work in the area of utilizing biotechnology in agriculture, and imroving and introducing new biotechnological processes in the food industry.

[Answer] In cooperation with other scientific centers, we will concentrate our activity on eight research-developmental goals. The coordination encompasses our own work as well as that of other ministerial scientific-research units, PAN institutes and establishments of higher learning. We are responsible for the implementation of determined topics starting with research all the way to their application.

[Question] Therefore, what are the proposed directions of the development and use of agricultural biotechnology in the coming years?

[Answer] The first topic includes the development and preparation of the production of biotechnological preparations which increase the fertility of the soil. There are, for example, bacteria which in coexisting with plants can assimilate nitrogen from the air, thus, giving a 10 to 20 percent higher crop yield. The goal here is the possibility of limiting the use of nitrogen fertilizers.

The next topic is tissue culture and the use of genetic engineering in crop cultivation. This is already being employed in our country on a small scale in flower growing. We are capable of reproducing some flowers in vitro and this is particularly useful in growing flowers that ae susceptible to viral infections. From one bud, one leaf, we can reproduce thousands of virus immune seedlings. We can also obtain other plants immune to viral diseases, acid soil or drought in a similar manner.

We will also conduct work on the biological means of plant protection. In destroying pests with chemical substances, we are also slowly killing ourselves. The rising needs of environmental protection and that of our health are making the production growth of biopesticides a necessity. In 1984, we set in motion

the production of "Bacillan" in our country. This is a preparation against certain types of pests. However, further research is necessary to optimize it and raise the effectiveness of its applications. We are also aiming at developing and applying new biopesticides, for example, against the potato beetle.

The fourth topic concerns raising the productivity of bulk feed by biotechnological means. Good vaccines as feed supplements are necessary. The annual production of silage in our country comes to approximately 50 million tons whereas the losses in its nutritional value during storage amount to nearly 30 percent. Improving the ensiling methods by adding microbiological preservatives would generate huge savings.

The subsequent topic is related to the preceding one and involves the production of lysine. Lysine is one of the main amino acids which determine the proper use of protein fodder. Such production would make us independent to a significant degree of the import of high-protein fodder ingredients. With an annual lysine production of 5,000 tons, it would be possible to use our own feed supplies more efficiently.

Our other work involves increasing the production of organic acids, thus for example, lactic acid, citric and acetic acid; expanding the production of enzymatic preparations; and improving traditional and introducing new methods of fermentation.

Some of the topics, which are being mentioned here, already have interested recipients; others do not, as yet. While waiting for concrete decisions and what accompanies them--funds, we have taken a risk in the meantime by signing several agreements of implementation and application. The work, which is in progress, cannot wait. We must act ahead, even taking risks, particularly when the ordering of appropriate equipment comes into play because, after all, later on no one will give it to us on a day's notice.

[Question] The institute's participation in the Central Research-Developmental Program [CPBR]; the continuation of the institute's own begun work and finally, the carrying out of expertise evaluations for the food industry which your institute services above all--all of this requires not only substantial financial means but also high class equipment and a highly skilled cadre.

[Answer] The institute finances its activity from three sources. Work conducted within the framework of central research-developmental problems will be financed from central funds allocated by the Office for Scientific-Technological Progress and Implementation [Urzad Postepu Naukowo-Technicznego i Wdrozen] whereas work based on ministerial programs will be financed from funds allocated by the Ministry of Agriculture, Forestry and the Food Economy. I have hope that the financial situation in both cases will become clear shortly. A second source of our finances is income derived from work commissioned by enterprises, and the third source is from the carrying out of small jobs, expertise evaluations and analyses, and from the sale of pure cultures.

To a significant degree; i.e., approximately 35 percent, we finance ourselves. Here, I am getting ahead of your question: there is no institute in the world that would finance its activity 100 percent. It is assumed that government funds constitute at least a half in the financing of research. In comparison with the 1970's, we have achieved progress because at that time nearly 100 percent of the institute's income came from the centralized fund of the ministry. This is a positive result of the three "S's."

[Question] And as far as equipment outfitting is concerned?

[Answer] What worries us is that which has affected all our scientific work in recent years. I can say that until 1980, we were on an average European level as far as equipment is concerned. We had a pretty good period behind us. During the mid 1970's, we acquired good laboratory and microtechnological equipment. However, the restricted possibilities in recent years of purchasing such equipment abroad and difficulties in obtaining it domestically have resulted in that today our equipment remains considerably worn out. The lack of a polytechnic station is also severely felt, thus, making the conducting of experiments on an industrial scale difficult or impossible.

[Question] Therefore, what are you counting on?

[Answer] We are counting--something which I am not hiding--on having the work conducted within the framework of CPBR provide us with the means that would enable us to fill in the shortages, if only partially. Unfortunately, a significant part of the equipment which we need is not available in the country and foreign exchange is needed to purchase it. Foreign exchange is also needed to buy reagents. We are able to finance a part of these purchases from our own allowances but this is only a drop in the bucket.

[Question] Thus, still a lack of the necessary equipment....

[Answer] I am an optimist and I believe that we will be able to afford the necessary equipment if the financial outlays for the implementation of the CPBR will not be solely in zlotys. I see a chance for the further development of the institute in the implementation of this program of research.

[Question] Does this also include cadre growth?

[Answer] During the last 5 years, our institute has experienced a large decline in people because of retirement and also due to the dissolution of employment contracts because of low wages. For a 10,000 zloty basic monthly salary, I will not find a young and talented engineer today, even though we are creating preferential treatment and incentives for the young employees to undertake doctoral work and making it possible for them to obtain higher qualifications and shortening to a minimum the period of low wages.

The wage issue has a very negative effect on not only the cadre number but also on its quality while the financial regulations continue to hinder the carrying out of appropriate cadre policies.

[Question] Regulations concerning the activity of institutes change quite frequently. How do you see this?

[Answer] These changes are a constant source of problems for us. In 1986, a new law on institutes and new regulations regarding financial and tax management are going into effect. I am hoping that the tax on above average wages will be more favorable than the old PFAZ based on net sales, if only for the reason that the so-called forced sales, which meant that the forced implementation of small jobs often of little vaue to the economy and the introduction of incompletely worked out projects took the place of research work, will disappear from scientific institutes. My only concern is whether this variant of personal tax will not lead to an excessive levelling of wages in a situation where it will be more profitable to give a raise to the employee earning less because the tax will be lower.

I have always felt and still feel that the "settling of accounts" with scientific institutes, which often employ a small staff, on the same principles as large establishments, is a misunderstanding.

[Question] Something which we have not mentioned is that the Institute of the Fermentation Industry is the largest scientific-research institution working for the needs of the food industry and last year, it celebrated the 35th anniversary of its activity. Such an anniversary entitles one to take a look at its accomplishments. In what way has the food industry and, therefore, also our ailing consumer goods market been enriched owing to your work?

[Answer] From the first years of its existence, the institute's activity has been focused, above all, on developing new technologies, on modernizing and intensifying traditional production technologies and on problems involving quality in the broad sense of the word.

The first totally new technology, that was developed in our institute was that of the production of dextran--a substance that is used as a substitute for blood. This preparation continues to be manufactured today in the Polfa pharmaceutical firm in Kutno. This was our first biotechnological development.

We have also worked out a production technology for several enzymatic preparations which are particularly useful in the production of beer, juices, and fruit and vegetable concentrates. In the future, their application in other industries will be expanded. For example, the replacement of enzymes of plant origin with microbiological enzymes has brought to the distilling of alcohol not only a significant lowering of work intensiveness but also a savings of approximately 20,000 to 25,000 tons of barley annually.

We are continuing our work on enzymatic preparations by improving "old" technologies and preparing a new selection for industry. At the end of last year, we introduced for production an improved technology to one of the manufacturers of these preparations whereby owing to this technology, the plant will be able to nearly double its production. I would like to add that the enzymatic preparations are used not only by the food industry but also by the textile,

tanning and chemical industries. From year to year, we are seeing an increasing need for these preparations and we estimate that in 1990, the industrial sector of the economy will need approximately 2,000 to 2,500 tons of them annually. Currently, total production of these preparations comes to approximately 300 tons.

We have developed and initiated the production of fodder yeast. It is obtained from the so-called manufacturing waste of distilleries and from molasses. By the end of the 1970's, approximately 40,000 tons of it were produced. Currently a drop has occurred to 15,000 tons. Outwardly, this appears absurd in our feed situation. However, it has turned out that the production of fodder yeast from molasses is uneconomical.

Besides other scientific centers, we have also contributed to the development of a production technology of lactic and citric acids. Today, we produce several thousand tons of them, and this is definitely not enough. Therefore, we must make up for the shortages with imports.

[Question] As far as I know, sewage wastes are a huge problem in the production of these acids.

[Answer] Yes. This is because we make them from molasses. I feel that in this case a thorough analysis would be useful as to whether it would not be better to manufacture them from sugar by using a non-sewage method. In the export of sugar, we receive $1 for 300 zlotys whereas sugar converted into, for example, lactic acid gives $1 for 60 zlotys.

We have introduced many new technologies into the so-called classic forms of fermentation. I am sure you remember that we had to import vinegar between 1981 and 1982. Our old, insufficiently invested plants are falling apart. We have recently developed new fermenting plants with considerably greater, than has been the case until now, production capabilities. Even though, we have just signed the agreement for the construction of a fermenting plant prototype, a line is already forming for it. If the results, which we obtained on a smaller scale, were to be confirmed in industrial production, then without exaggeration this would be a sensation not only on a national scale.

For the fruit and vegetable industry, we have worked out the fundamentals of the production of condensed fruit and vegetable juices with the ability to recover the aroma; of solidified products, such as pastes and granulated products; and finally, the technology of special products from fruits and vegetables for infants and children as well as dietetic food products for the ill.

Of course, I have not mentioned all the work of the institute which has been put to use in industry. Annually, we conduct approximately 60 scientific-research studies and we turn over approximately 20 percent for use.

[Question] Fundamental studies, above all, offer the change for biotechnological development. What is their percentage share in the work of the institute?

[Answer] Approximately 10 to 15 percent. After a year, a part of them goes into developmental work. If we conclude that a conducted study is not very promising, we then decide to terminate it. However, if we can already initially determine the effects of its application in industry, then during the phase of introducing the research topic to our plan, we try to make contact with those enterprises that have the potential for applying the future development.

In the past, it occurred frequently that from the conclusion of a research project to its application, an overly long period of time elapsed whereas the cause lay in the lack of capital investment activities. Currently, we actually do not take on any major work, particularly the kind whose application requires large capital outlays, if we do not have an agreement with an industrial plant for putting it into use.

If we do take on a project, we must be convinced that it is something that is needed; we must know how much it will cost and what kind of economic effects it will give.

[Question] What is your assessment of cooperation with industry?

[Answer] For many years the atmosphere in the country was not conducive to technological progress. Besides a production plan, every enterprise has had and has progress plans. Directors were fired for not fulfilling the former and the latter were sometimes left on paper and no one was made responsible for this. We cannot change such a situation immediately.

It is my estimate, however, that the situation is somewhat better although there still exist economic mechanisms in the reform solutions which result in that enterprises continue to reveal--to a somewhat lesser degree--a lack of interest in ushering in new and even significantly energy conserving production. New technology is always associated with risk, and this was never included in the assessment of enterprise activity.

[Question] In other words, this year's list of the institute's developments to be placed in operation did not come about at the request of the industrial sector?

[Answer] To a great extent this still remains our offer aimed at industry. This upsets me because I greatly value the work that is carried out at the initiative of industry. Such work gives a greater assurance of being implemented and, after all, the greatest satisfaction for the creator of something is to see the concrete effects of his efforts being applied in industrial practice.

[Question] Even if this work does not measure up to central or ministerial problems?

[Answer] The specificity of the food industry lies in the fact that 90 percent of it is made up of small plants. Their production value is small as are the allowances for the developmental fund and for this reason, they are particularly interested in the developments whose implementation does not require new machinery or new buildings--and this compels us to be inventive.

I have already mentioned that the majority of our developments, which have been placed in operation in industry, intensify the traditional production processes and makes them more economical.

[Interviewer] Thank you for the interview.

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EAST EUROPE/BIOTECHNOLOGY

ROMANIA DEVELOPS TEXTILES FOR MEDICAL IMPLANTATION

Bucharest INDUSTRIA USOARA in Romanian No 12, Dec 85 pp 545-547

[Article by Engr Aristide Dodu, Engr Iulia Petrescu, Engr Aristide A. Dodu, Engr Pia Ciobanu, chemist Cristina Carp, and physicist Anca Maria Popov. Survey presented at the Bucharest Technicoscientific Symposium of the Textile Industry, 24-26 September, 1985]

[Text] Modern surgery successfully utilizes textiles for replacement of various human organs and portions of organs. Hence, synthetic polyester yarn converted into special textiles can provide human prosthetic implants.

On the initiative, with the cooperation and support of Prof Dr Docent Ioan Pop D. Popa, head of the Cardiovascular Surgical Clinic at the Fundeni Clinical Hospital, a collective of specialists of this hospital, the Textile Research Institute, the Neurosurgical Clinic -- Dr Marinescu Hospital, the Panduri Oto-rhinolaryngology Surgical Clinic, ICECHIM [Central Institute for Chemical Research], CCFS [Committee for Physical Education and Sports], IPI [Iasi Industrial Design Institute] and ICPCMP [Research Institute for Leather, Rubber and Plastics] (as part of a program sponsored by CNST [National Council for Science and Technology] and financed by the Academy of Medical Sciences), in the last 5-6 years have tackled large-scale research projects for domestic production of a wide range of textiles for medical implantation.

The leading body of the Ministry of Light Industry and of ICT [Textile Research Institute] encouraged the creation, in the first stage at ICT, of a microproduction pilot station for medical textiles. Presently, with the support of ICSMCF [Institute for State Control of Drugs and Pharmaceutical Research] in Bucharest and SVIAM [Section for Testing and Maintenance of Medical Instruments] in Bucharest, items homologated and currently produced are: (cylindrical and conical) bifurcate vascular prostheses, a broad array of organ reinforcement or supporting nets, patches and supports for biological heart valves. Surgical cord, sinus walls and arcades are in the process of being homologated.

The domestic production of such items has required the concentration of tremendous research forces for adaptation or creation of new equipment and the development of specific technologies.

A great number of tests and clinical observations proved that the most adequate textile for medical implantation in humans is provided by polyester yarn, which has the following characteristics:

a. It is well tolerated by the human body;

b. It retains its stretch resistance in time;

c. It is relatively inert chemically and physically;

d. It is not carcinogenic;

e. It does not cause allergies or hypersensitivities;

f. It has a very good dimensional stability in aqueous medium and air and is characterized by absence of biological activity.

For the development, at this stage, of medical knit textiles, under cooperation with Iași CFS and CCFCh [not further identified] -- Laboratory 3 Iasi, polyester yarn was developed with the following specific characteristics:

a. Textured yarn with great potential elongation, designed for the production of vascular prostheses and vascular bioprostheses;

b. Post-treated textured yarn, destined for knitting the supports for heart valves and plastic patches;

c. Rotoset stretched yarn for the production of nets for various surgical procedures;

d. Twisted yarn with minimum contraction, destined for the production of the cord which serves to make and suture the medical knit textiles in the body.

Production of Biological Heart Valves

The MIVA-Pop D. Popa biological valves are the subject of the invention patent OSIM No 78 309/1983. They are characterized by a frame support out of propylene coated with polyester knit. The biological portion is provided by the boar heart valve. The coating knit is made from textured polyester yarn in double knit on a fast tricot machine. Preserving the knit's capacity of fitting to the frame support is due to a specific finishing process which is only based on the process of degreasing at the temperature of maximum 70°C. The new

production technology also involves projects for improving the manner of coating the plastic frame support with knit by using a new kind of collaret, and improvements in production and suturing proper. The "tor" shaped silicon rubber has been replaced by a collaret made from knit textile which also serves to coat the frame support.

The new kind of collaret is based on a unique technology which is the subject of the invention patent OSIM No 85606/1985, the Socialist Republic of Romania. The procedure involving the coating with knit textile is carried out in several stages. The biological portion of the valve is collected from a boar and after a complex dressing process is fixed by suture in the support. The supports, the biological valves respectively, are produced and supplied in special containers, in nine type-sizes with the implantation diameter of 19, 21, 23, 25, 27, 29, 31, 33 and 35 mm conventionally coded as items 4001-4009.

Production of Vascular Prostheses

Linear cylindrical, linear conical and bifurcate vascular prostheses are turned out. These prostheses are produced by knitting polyester yarn on specially built machines, in very great finenesses. The structure of the knit and the processing technological parameters assure optimal porosity of the artery walls, so that blood losses in the prosthetic procedure are minimal, with the knit's permeability to water ranging between 2200 and 2600 $cm^3/cm^2 \ min^{-1}$. After knitting, the knit tubes undergo complex finishing and cleaning procedures. For the purpose of improving some functional technical features, by using a new technology which is the subject of invention patent OSIM No 84654/1984, experts have developed vascular prostheses with potential elongations of 150-300 percent. The mean values of the major physicomechanical features are:

a. For linear vascular prostheses:

1. Diameter, mm: 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34

2. Lenght, mm: 200-800

3. Potential elongation, percent: for type G 10-30
   for type 2G 150-300

b. For bifurcate vascular prostheses:

1. Diameters, mm: 14/7, 16/8, 18/9, 20/10, 22/11, 24/12
   or 14/8, 16/9, 18/10, 20/11, 22/12, 24/14

2. Length, mm: 250-600

3. Potential elongation, percent: for type G 10-30
   for type 2G 150-300

4. Porosity (permeability to water), cm3/cm2 min^{-1}: 2200-2600.

For monitoring the position of the vascular prostheses after human implantation these have generators labelled with black polyester thread in mass.

The final cleaning of vascular prostheses is done under very special conditions, so that not even 1/10 000 g heavy metals for 1 liter extract should exist on the finished product. Sterilization is performed on the user.

Production of Plastic Patches

Tricoplast type plastic patches are used in obturating orifices in the internal walls of the heart. The plastic patches are made up of knits out of polyester yarn, by knitting on fast tricot machines, in structures, which supplemented with a special finishing which is in the process of patenting, assures an outstanding stability and rapid postoperative impermeabilization.

Production of Plastex Tricots

The net-shaped tricot with a specific structure is used as reinforcing material in the production of vascular bioprostheses, in reinforcing the abdominal muscles, in the production of the meninges substitutes, the production of the rhinoplastic prostheses, arcades, auricles, allografts for ozena, and so forth. The tricot was produced on fast tricot machines by using rotoset polyester yarn with length densities ranging between 33 and 167 dtex. After degreasing, the tricot is thermofixed under the conditions of current production. The Plastex tricots are supplied in the following sizes:

a. 80 X 5 cm for consolidatingumbilical cords, respectively for production of bioprostheses;

b. 7 X 7 cm and 7 x 3 cm in allografts for ozena;

c. 25 X 25 cm or 30 X 15 cm for consolidating abdominal muscles;

d. 10 X 10 cm for meninges substitutes, and so on.

After radical cleaning by specific technologies the tricot is packaged unsterilized, with sterilization being performed on the user.

Production of Filmed Surgical Cord

The Filmed surgical cord, used in making the prostheses for implantation on a long-term basis in humans, consists of superior quality polyester yarn, based on complex procedures which assure it proper dimensional stability, minimal elongation and great tenacity.

The production of improved surgical cord out of polyester yarn with length density of 100-480 dtex stemmed from the need for doing away with the drawbacks of the surgical cord out of syntetic polyamide yarn 536-2200 dtex, which, besides forming snarls especially in humid state, is not adequate for long-term implants (it is biodegradable in time and is far too thick).

The twisted surgical cord, because of developing snarls hampers the suture procedure. It was concluded that a cord produced by plaiting polyester textile threads fully conforms with the goal pursued. In the context of this idea, a wide range of surgical cord was developed by plaiting, from the array of PES threads made at home. The polyester yarn with great tenacity and length density from 33-167 dtex with 350 twists/m meets to the highest degree the conditions required for the plaiting process. For the development of a surgical cord with low elongation (below 10 percent), the cord is subjected to extra spooling processes under constant tension and thermofixed with hot air at 200°C. The surgical cord is supplied in yardage or in sizes of 50, 75, 90 cm. Under cooperation with the Bucharest Knitting Needle Enterprise the near future will see the supply to surgical clinics of cord with atraumatic needles. Cooperation with the Fundeni Cardiovascular Surgical Clinic, the Panduri Otorhinolaryngological Clinic and the Dr Marinescu Neurosurgical Clinic will be conducive to new kinds of human medical implants. It can be assessed that the results of our research work are meeting halfway the major tasks on the input of textile and medical research, as to the efforts for cure and improvement of the quality of human life and also in terms of important foreign currency savings which result from elimination of the import of such products.

11710
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EAST EUROPE/COMPUTERS

OVERVIEW OF DISTRIBUTED INTELLIGENCE PROCESS CONTROL SYSTEMS

Budapest MERES ES AUTOMATIKA in Hungarian No 6, 1985 pp 201-206

[Article by Dr Istvan Vaskovi, Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences (SZTAKI): "Overview of Distributed Intelligence Process Control Systems." The first paragraph is the Hungarian summary. The article was received for publication 23 January 1985.]

[Excerpts] The article reviews the development of distributed intelligence process control systems. It breaks the systems down into five components and examines these system components. It briefly summarizes the foreign and Hungarian situation.

The swift development of microelectronics, computer technology and remote data processing has made it possible to satisfy the need for computerized control of large, complex technological processes. Today the distributed intelligence process control systems best suit this purpose.

The significance of these systems has been recognized in our country also. This is proven by the fact that the development of distributed process control systems constitutes one of the target programs of the OKKFT [National Medium-Range Research and Development Plan] and that both the MTA [Hungarian Academy of Sciences] and the OMFB [National Technical Development Committee] support the development of these systems.

This process has taken place similarly, if with a certain delay, in the CEMA member countries. Process control minicomputers have appeared as members of the ESZR-MSZR [Uniform Computer Technology System-Minicomputer System] family. After the initial software difficulties the PDP type machines took a leading position in the area of process control in the CEMA countries also (the Soviet SZM 4 and the Czechoslovak SZM 52), since the rich DEC basic software can be used on these. The Long-Range Machine Industry Cooperation Target Program posted the goal of introduction of automatic control of technological processes (ASZU-TP) in certain stressed branches of industry.

In our country the beginnings of the switch to digitial technology go back to the first half of the 1960's (use of special digital equipment in the Szeged Canning Factory). At the beginning of the 1970's they tried to put an EMG 830/10 process control computer into operaion at the Gagarin Thermal Power

Plant. The VT 1010B, R-10, TPAi, TPA 70 and PRACTICOMP 4000 domestic process control minicomputers appeared in this period. Their process control application was protracted. Programmed cylinder alignment based on a VILATI PC-4000 was put into operation in 1970 at the hot rolling works of the Danube Iron Works. From 1972 to 1976 the KFKI [Central Physics Research Institute], in cooperation with the VEIKI [Electric Power Industry Research Institute], installed six computerized systems based on the TPAi at the Dunamenti Thermal Power Plant. Putting two process control systems based on the R10 computer into operation was completed at the end of 1979 at the Pet Nitrogen Works, with the cooperation of the SZTAKI and Videoton. The first process control microcomputers (Videoton-RPT, MMG-SAM, SZTAKI-MFB, KFKI-ICC and BME-Medicor-MMT) were also prepared in our country in the second half of the 1970's. The first more serious process control applications using domestic microcomputers were prepared by 1980 (the Sarkad Sugar Factory MFB, gas industry applications of the SAM and petroleum industry applications of the ICC).

The development of distributed process control systems started in the CEMA member countries also. An ESZR-MSZR concept pertaining to local networks was developed as part of the MSZR Conception Preliminary Development Plan.

Distributed process control systems developed by ourselves are not yet available in our country. The KFKI developed a local network, called LOCHNESS, primarily for laboratory measurement data collection and process control purposes. It uses ICC's at the intelligent terminal level and TPA processors at the higher level. The SZTAKI developed a network, called PROBEWAY, for process control purposes using the PROWAY standards and based on microcomputers developed at the SZTAKI (MFB, INTELLICON, mini-MFB and SYSTER terminals). The Instrumentation and Metrology Faculty (MMT) of the Budapest Technical University, in cooperation with Medicor, developed a local network, called the MMT-HNS, on the basis of the earlier developed MMT system, primarily for measurement data collection.

We have summarized in Table 1 the chief characterstics of the domestically developed process control networks:

	PROBEWAY	LOCHNESS	MMT-HNS
Manufacturer	SZTAKI	KFKI	Medicor
Standard followed	PROWAY-A (approx.)	ISO OSI, IEEE 802	ISO OSI
Signal trans. device	twisted pair	coaxial cable	twisted pair
Network seizing method	HDLC	CSMA/CD (modified) (HDLC)	CSMA/CD
Network topology	bus	radial hierarchy	bus
Signal trans. speed	62.5 K bits/s	1 M bit/s	125 K bits/s
Signal trans. dist. (max.)	2,000 m	circa 1,000 m	500 m
Number of stations (max.)	16	32	--
Connecting equipment	MFB, MMFB, SYSTER, INTELLICON regul.	TPA 11, ICC	MMT
Operating system	CP/M	RSX	CP/M
Status	experimental	experimental	experimental

One or more computers can be used in the control room for supervisory or optimization tasks or to support the man-machine link. These computers make up the control room stations of the communication network. Micro or minicomputers can be used for this, often with an operational memory capacity of 1 M byte.

In distributed process control systems the process control software is generally made up of modules which carry out the activities connected with analog or discrete control or solve the arithmetic operations.

The operating system of the control room mini or microcomputer stations is a real-time operating system, most often RSX in the case of a minicomputer and CP/M or RMX for microcomputers. The languages recommended most often for development of user software in the case of the control room stations are PASCAL, C, MODULA, ADA, PEARL and FORTRAN. When developing the database the principle is followed that only that local data should go into the database which requires further processing. A central and a distributed database can be developed on the control room computers, both have advantages and disadvantages.

The Man-Machine Link

A review of the man-machine link system component remains. Color graphic and black-white alphanumeric displays are used in a modern control room. A display divided into three parts is widely used--using overview, group and individual images. The overview images are usually displayed on the color graphic display. These have taken over the role of the obsolete large schematics. By using the group possibility it is no longer necessary to display in one image an unsurveyable volume of information. The group display makes possible the display of parts of the schematic, diagrams, trends and signal lists by station partly on the graphic display and partly on the alphanumeric display. The alphanumeric display serves to display individual characteristics; it provides a detailed display of the characteristics of each control cycle. The possibilities given by the color display can be used well to distinguish information, attract attention and indicate dangerous situations (together with a sound signal). It is customary to break the surface of the screen into fields where each field has a distinct role (message field, general field, overview field, input field, etc.). The content of the screen can be printed out in hard-copy form on paper. Operator consoles with different keyboards, functional push buttons or touch sensitive screens can be used to input information. Various printers are available to print out necessary summary journals and event and trouble journals.

With the aid of efficient tools for the man-machine link the operator's functions broaden, extending to operation, supervision, testing and diagnostics.

Biographic Note

Istvan Vaskovi is a chief scientific worker at the Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences. He earned his diploma at the Instrument Manufacturing School of the Kharkov Technical University in 1970. For 2 years beginning in 1975 he worked as a scientific

colleague at the International Institute for Control Problems in Moscow. He won his candidate's degree in technical sciences in 1978. He was made an honorary doctor of the Technical University in 1980 on the basis of a resolution of the Presidential Council. His area of interest is automated control systems for technological processes.

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EAST EUROPE/COMPUTERS

HUNGARIAN SOFTWARE ENGINEERING DESCRIBED

Budapest INFORMACIO ELEKTRONIKA in Hungarian No 6, 1984 pp 303-306

[Article by Dr. Zsolt Varkonyi: "Software Engineering Activity in Hungary"]

[Text] R. Yeh, in article (1) has examined the situation of software development. He pointed out the factors influencing the productivity of the software industry and the quality of the software, and he sketched the new opportunities which software engineers are facing. He emphasized the importance of the use of software development tools. Finally, he formulated the following demands placed on the software engineer: first, the methods and environments of program development must be refined in order to improve productivity and quality; second, one must step out of the laboratory and introduce laboratory methods and tools into the software industry.

R. Yeh argued on the basis of American-Japanese comparisons. What about Hungarian circumstances? Since reliable data are unavailable in this area, we attempt here to review the situation related to software development and software development tools on the basis of our own experiences. In spite of the fact that in comparison with article (1) slightly different conclusions can be reached regarding domestic software development engineering activities, we observe that R. Yeh's remarks concerning the application of the methods and tools of development are by and large true as applied to software development in Hungary.

In our economic, scientific and educational life software engineering has only appeared at the level of the laboratory. Most of the jobs are small. Medium or large jobs (larger than 10 million forints, occupying more than 3-5 years or 5-10 people) are few. Even if there were any, there are hardly any customers and absolutely no reliable, major enterprises satisfying this need. For this reason the big tasks are fragmented into smaller, even tiny, solvable parts from which the desired complex system can in time be built up, it is hoped.

There are some characteristics of our environment which are of interest for the improvement of software development. Some of these could be described as follows: the coputer-technical knowledge of different responsible directors is still low, superficial, and unsuitable for making decisions. A short-term, direct, quick-return economic philosophy prevails in software development. In planning, one does not think ahead to the maintenance of software, even if it

is intended to be marketed several times. The development of software tools does not justify the expenses during the course of a development job, except in cases where these have been ordered specifically; so that even for large, complex systems (such as information systems) there are no tools produced to support development. Patterned on the construction industry, developers today are better off by suffering through a long period of error search and modification, often uncompensated, than to prepare the system thoroughly, supporting the planning and manufacturing with software tools; that is, doing intelligent development for the long term. This is currently the "economical" solution because the organizations that comission large systems do not invite competition from the suppliers--true, there are not many on either side-- and so the customers are really at the mercy of a few large development institutes. Even in these institutes research relating to software development has slowed down because, due to the coercive forces of the market, the majority of the about 100-head strong research and development group (not counting assistants, program encoders, and their directors) writes programs for immediate consumption. We can talk about only one or two development projects on the laboratory level (SOFTING, ISAC-MOZART, QUALIGRAPH), and even with these systems practical experience is derived mostly from applications abroad.

Problems can also arise from the qualifications of the software developers because, in spite of the fact that these are generally high, the ratio of university graduates among them is in general higher than among workers in Western countries, research in software development has not made much headway in our universities. Computer science has, for example, no independent department or institute in any university. It is true that specialists who could confidently teach the different parts of this field on the basis of their own experiences are, indeed, rare.

Much depends on whether there are software developers at some of the devlopment sites who possess initiative and outstanding ability and who are also attracted to the technology of software development, and who are able to lead. If there are such people, and their microenvironment does not obstruct their work, then, relying primarily on information gained from the literature, they will have the opportunity to re-create the methods and tools of modern software development (this is the practice in Hungary), and on the basis of this experience increase their know-how. The trouble with this approach is that there is a highly developed computer environment behind the methods and tools found in the foreign literature which is not mentioned in writing, being a matter of course, and in adopting and re-inventing these methods one generally looses sight of this fact. Many failures can be traced to problems which have their origin in the differences between the two environments.

While we can read little about the eminent importance of the reliability of hardware in reports about software written for the IBM, Honeywell, CDC, HP, DEC, ICL and Siemens machines, the designers of software for the medium to large and mini machines, which make up the major part of the Hungarian machine pool, must concern themselves with this problem. The necessity of applied research into the reliability problem originating from the behavior of our hardware has often occured to the engineers developing larger-sized and more

complex systems. This matter, considering our background resources and opportunities, is still a current worry.

One can chance a statement: According to our experience, if a creative, interested, relatively educated individual appears where there is a modern and reliable machine, then, regardless of his prior education, the environment of the modern and reliable machine provides the impetus for the intelligent use of methods and tools and for an acceptable quality in software development. It seems therefore that the computer determines the level of software development and quality.

Our software development projects--I am not thinking about simple programming--always enter public contiousness wrapped in a package. The probable cause for this is that in order to secure the centrally-administerd funds which promote and support development, one has to declare interest in goals which are nationally fashionable at the time. Presently the establishment of networks is the topic of the day. Under its influence we are urged to develop special hardware and TAF-governing software. We publish many articles in this field, but we also know that if we pass a certain distance (or even a certain number of users within a local area) we run into one of the great problems of our infrastructure, the unreliable long-distance transmission of information. Fortunately, the number of those is increasing who, while constructing their own active, practical systems, have recognized this difficulty. These people recommend a non-centralized system of information processing that can satisfy local demands. Such systems require new, special software development and new software engineering research. In addition, the rapid development of professional microcomputers has produced a totally new environment for the developers of software in which they can solve problems that were impossible to tackle before.

We cannot strive for completeness in a paper meant to be a survey, so we are focussing on the methods and tools of software development. With our references and examples we aim to help those who are interested in these topics.

It is not difficult to find one's way among the tasks facing software engineers. If necessary, a variety of articles concerned with classification and categorization can be consulted. While one paper connects software engineering activities with the phases of the life cycle of software development, another classifies software engineering tasks into types. There are papers in which the authors regard only software development tools as being part of software engineering, and there are some--these are the foreward pointing ones--which distinguish software development types and define software development environments of different sophistication for these. In the environments so defined the authors distinguish the development tools necessary for each phase of development. It must be remarked that the expression "development tool" is not used in a unique sense in the literature: many only mean programming tools by it, while others include methods, theories, standards, aids, libraries; that is, things not directly connected with programming. All these are surveyed in papers (2), (3), (4) and (5). Software development tools in a more restricted sense, using also the definition of the NBS (2), are all the computer programs which aid work in the

various phases of development, such as writing specifications, planning, testing, documentation, maintenance and the direction of development work. Such well-known tools as compilers, text editors, etc. belong in this category. According to reference (5) there are fundamental tools which are part of every development environment, as are in addition to those already mentioned the linkage editor, supporting programs used during running time, and programs looking for errors in the source code. One must add those tools which have not achieved wide-spread acceptance but are already in limited use: programs to support planning, programs analyzing programs, testing programs, and even those about which some information is available but where the tools themselves are still at a laboratory-research level, as is the case of systems that check programs in a formal manner, or in the case of complex program development environments. In a wider sense, one could include under the heading of software development tools the tools which are not actually part of programming, such as the different diagrams (data flow, HIPO, Chapin chart), the methods (Jackson), the standards, and the reports that provide information for the direction of development. The number of commercially available tools is around 1000. The Automated Tools Index advertised in reference (6) offers the detailed description of 750 automated software engineering tools.

The picture we get of domestic usage, if we base our estimate on the last 30 issues of SZAMITASTECHNIKA (November 1981 to April 1984), is depressing. If we do not count the OSAK advertisements and the reviews of new operating systems which are mentioned when new machine types are described (about 4-5 in this period), then not even 10 articles have appeared in this area. Among these, the ones describing the ANSWER/CDL2 language system, the MOZ-ART and the SIDES are at the level of advertisement/information, while the articles on MPROLOG and GESAL are somewhat higher level. Truly useful information has come only from accounts based on experiences from actual runs, as was the case in the articles describing the large-scale software production at BUDAPRINT, the KSH Computer Center, and at the EGSZI. The situation is probably not as bad as regards the utilization of tools. We have word that software development supporting tools are being worked on at the SZAMALK and that the QUALIGRAPH developed at the SZKI is an effective tool of software analysis and performance testing. In the domestic HP 3000 environment we have favorable experiences with skeleton programming and with the use of high-level code generators. The latter can be regarded as the most modern tools today. We remember, however, that at the end of the 1970's there was in this country a then-modern supporting tool for COBOL development, the SERIES-J, which ultimately did not become well accepted, presumably because of a lack of demand for it. Knowing the peculiarities already described, one is not surprised that the "prototype production" project defined in the working plan of the centrally financed program that was started at the beginning of the '80's and which had as its goal the creation of software tools and methods (locally called "software technology") supporting software development, was not accorded a favorable reception. With the relatively cheap high performance professional microcomputers it is possible for the consumer to decide not on the basis of 100 pages of system documentation but on the strength of immediate, hands-on experience with a refined demonstration system. Even the necessary software is accessible today, such as CONDOR for microcomputers, software that works on a relational database.

Following the complete life cycle of a piece of software is not a vital necessity in our country. The development of larger systems is in general sufficiently protracted that one cannot distinguish clearly the individual phases of the life cycle. In fact, after the first experimental demonstration there is continual further development which never arrives at the classical stage of maintenance. In practice, development consists of two large phases: pre-development, which is concluded by the experimental demonstration (presentation) and which accounts for almost 100 percent of the expenses, and continued-development which lasts until some event--the arrival of a new machine, the completion of a new system, loss of interest--interrupts the process.

If one can accept this statement, then it would be practical to regard the pre-development as the preparation of a prototype--of course, one should then really build a prototype--and the continued-development as the actual development period. A split in costs of 40 to 60 percent between the two phases would be realistic. It is likely that in that case the developers and those who have commissioned them would face fewer problems with task description and problem solving over the long term.

One could and should teach the use of software tools. One can expect some improvement in this respect from the proliferation of professional microcomputers.

There is a very large number of programs and program modules in preparation in this country, mostly to satisfy individual demands. These intellectual products, apart from certain exceptions, are generally not utilized repeatedly. Among the reasons one finds insufficient preparation for marketing and documentation that is frequently missing completely. Also lacking are the placment of programs on a national register, a suitable library, and tools able to effect the conversion of software written in different source languages. Unfortunately, there is no agency interested in these problems. Missing are therefore all valid reasons which would motivate a developer to prepare his program module or subroutine so that it can be used by others. In this area the only really good results (which are small and local projects) come from personal initiative; in the activity of the OSAK or other enterprises one cannot find a discriminating approach. It would be more effective and would be a step towards the more intelligent management of the intellectual potential of the country's economy if a suitable enterprise would assume responsibility for this task. One should attempt to provide classification systems that work according to different criteria (ranking, retrieval; see references (2), (3)), a data base handler that would store the components and properties of the software, catalogs for retrieval, information tools, unified, computer-stored documentation (all of which could be maintained together with the program), standard specifications, and so forth. A commercial firm could do this for the country, perhaps functioning as an intermediary. It would need a staff with very substantial software expertise, standardization and a suitably enhanced machine (not necessarily a large computer). It seems that in the hands of the proper organization this presently unexploited resource could be mobilized quickly to contribute to production, exerting a major effect on the development of software engineering and on the preparation of software development tools.

It is a peculiarly Hungarian characteristic that since 1976, with significant central support, a major portion of the software developers has worked on the design of environments for software development. Data from the literature and trips abroad have sparked the hope that one will be able to produce an integrated comprehensive assembly, similar to but more modern than CADES, the new ICL New Range software development environment. Of course, the real goal was the support of the development of application programming systems. The domestic research in this area--taking into consideration the Hungarian computer environment, the difficulties of development, and the changes in demand over time--has resulted in the creation of the ANSWER environment for program development which was first based on an UNIX-like operating system, using CDL system programming language, and then on a system program which is integrated into a more highly developed version of CDL, the CDL-2. For a number of years parts of this effort have been used for implementing the ADA system programming language. (This use is efficient, because the large computer on which development is taking place is efficient). Work on the implementation of an ADA environment for software development is in progress, a project carried out entirely in Hungary.

The distortion of the original goals was perceived relatively early on, and from 1978 intensive research was started in the area of environments for applications development. The then-current literature labelled PROTEE and HIPO with the just introduced term of "technology", but the developers had to discover quickly that there is no unified, tool-supported technology that would cover the whole life cycle of software. This discovery led to a mosaic-like assembly of recommendations, methods and tools, called MOZ-ART. Related to this approach are SOFTING (which is under development with foreign cooperation) and the domestic SOMIKA, as well as the first domestic environments to determine software quality. None of these were technologies that monitored the complete life cycle--SOMIKA in particular was designed to test finished software--but the authors of MOZ-ART and SOFTING strived to treat the phases of the life cycle beyond program design, coding and testing.

The experiments for developing environments that have been mentioned so far were based partially on the literature or on foreign cooperative agreements, in an incidental manner. The central languages of these environments--apart from CDL2 for ANSWER--were one or two widely known, so-called conventional or third-generation languages. Our unique situation, however, permitted us to conduct experiments in the area of the development of non-procedural languages (notably PROLOG) that were successful even by international standards. The MPROLOG environment, relying on the PROLOG language, points beyond the fourth-generation software to the fifth, as illustrated by the fifth-generation programs in Japan.

It seems that enough software development environments have been examined that the various development projects could be coordinated, and it were useful if the projects in this domain were classified and evaluated according to the needs of the users. Creation of automatic software development environments can be regarded as a correct approach. This idea is emphasized in articles (1) and (5), and this is what the Japanese remind us of also. This is what

inspired the "Alvey software engineeing" strategy in England (the Alvey Project) which is an answer to the fifth-generation project of the Japanese.

Leading software engineers in Europe have discovered much earlier the need for the production and application of software development environments in order to produce usable quality software within a reasonable time and at an acceptable price. One outcome is SYSLAB, a name that refers to its laboratory origin, another, a common project of NCC and the West German GMD, is SDSS (Specification and Development Software System), which attempts to cover the complete course of software development.

Already in 1980 the Swedish developers were using a microcomputer while working out certain portions of SYSLAB. In fact, microcomputers have now reached and even surpassed the capability of well-known medium and large computers; for example, the 32-bit super micro RAIR is superior to the largest VAX. High-capacity Winchester storage is also on the market. The relatively inexpensive nature of these systems opens up a new chapter in computer engineering. As an example, one might mention the rapid windowing technique (as in VisiON) and the picture software (as in VisiCalc and 1-2-3).

We cannot neglect the fact that decision-making systems and unified office systems--the increasingly prominent applications of microcomputers--demand a new approach to software development. The development of a software tool kit is needed that enables the rapid combination, expansion and modification of systems. These tools are becoming more and more differentiated and specialized. Besides the already-mentioned icon software and windowing, one naturally needs analytical software for economic planning, languages for modeling, and software for data processing.

A new chapter is the appearance of "application generators", the apparent need for non-procedural user languages. Satisfying consumer convenience was one motivating force among others that led to the development of what are collectively called "fifth-generation languages." Briefly, they are characterized by noting that their use can be learned in 2 days by the user or the software developer, and that with their help one can develop application systems an order of magnitude more rapidly than with COBOL or PL/I. The syntax of these languages is therefore problem oriented. These languages having largely non-procedural structure provide, according to past experience, an opportunity to produce a faster, more reliable and more directly acceptable end result than would be possible with the traditional, strictly structured approach, because they are able to approximate a "prototype." The heart of the approach is that instead of large-scale specifications, prototype functions are developed which make possible, starting from the first partial results, the realization of the user's remarks and wishes. The results and experiences with MAPPER, Mantis, LINC, RPG-3 and PRO-4 are promising.

In spite of the fact that Hoare, in one of his lectures this year, has pointed to the high level specification languages as the tools of development of the future (as opposed to the fast-advancing logical, non-procedural languages), one cannot dismiss the importance and the opportunities inherent in the latter. This was recognized by the Japanese when they chose PROLOG as the central language of their fifth-generation program, this is underlined by the

so-called "knowledge representation" languages in the realm of artificial intelligence research, and by the languages chosen for expert systems where PROLOG again plays a determining role. Fortunately, our peculiar circumstances permit us in our third-generation computer environment to pursue research and development that points toward fifth-generation languages. This is promising ground for the software engineer of the future.

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OVERVIEW OF HUNGARIAN ROBOTICS EFFORTS

Budapest IMPULZUS in Hungarian No 8, Mar 86 pp 6-11

[Article by Zsuzsa Szentgyorgyi: "Without Illusions"]

[Text] Is it proper to study soberly, without prejudice or exaggerated expectations, what we must do and what we want to do for the effective spread of robotics in the plan period standing before us? A starting base is given, but the possibilities given by our economic potential and technical receptive ability, the variety of products available and the level of international cooperation limit our opportunities.

First of all we must weigh what extra advantages the use of robots involves in production. On one side are the saving in live work, supplementing the manpower which is lacking in many places, the need to improve quality indexes (precision, reliability, etc.), an increase in the ratio of active producing work time, the possibility of realizing flexible production and, where necessary, introducing a third shift. On the other side of the balance are the capital needed to obtain robots (the developmental base), the necessity of introducing new organizational methods and procedures and getting them to take root and the need to convert professional knowledge or bring in new manpower.

It is well known that a large number of Hungarian enterprises are in debt to a significant degree or, even in the best case, have few developmental funds. It also represents a problem that the assortment of robots on the domestic or socialist market is limited and it is difficult to get them from capitalist countries either because their purchase runs into an embargo or requires much convertible foreign exchange. At the same time the wage system, the relatively cheap price of Hungarian labor, is not a sufficient incentive for a reduction in manpower expenditures (with the exception of those areas where there is no possibility for an extensive expansion of manpower, as in foundries, metallurgy or welding).

An especially essential factor for the economical use of robots is suitable organization. A continual and rational supply of material, parts and workpieces is needed for continual and rational operation of robots. In general we cannot speak of robot use by itself because under industrial conditions the robot is a part of some processing, material transforming process, something serving a series of production operations. This also means

that we must think about an appropriate transformation of the labor force. There is no doubt that with the use of robots manpower can be freed; we can replace with them primarily the work done by those trained on the job or skilled workers with low qualifications. At the same time there is an increasing need for highly trained workers who can program, maintain and serve the robots or the manufacturing system working with robots. All these things establish the steps which must be taken.

Where are we now? All the necessary activity for use of robots in domestic industry--research, development, manufacture, use--started a few years ago, there are those who cultivate robot technology and the circle of them is being expanded by more and more enterprises and institutions. As an initial step it was necessary to obtain the rights for robot manufacture and sale which could be started on the existing technological base and to start the developments and experimental applications connected with these.

Thus far in our country they have used robots first in the machine industry. Probably the demand for robotization will be greatest in this branch up to 1995. The Bakony Works, the Csepel Custom Machine Factory, the Precision Fittings Factory, Tungsram (and the Gyongyos factory of the MEV [Microelectronics Enterprise], MOFEM and REKARD have taken useful initial steps and even already manufacture a few simpler robot types.

DANUVIA, the EMG [Electronic Measuring Instruments Factory], the Precision Fittings Factory, the IMI [Industrial Instruments Factory in Iklad], the MEV, the MIKI [Instrument Industry Research Institute], the MMG [Mechanical Measuring Instruments Factory], MTA SZTAKI [Computer Technology and Automation Research Institute of the Hungarian Academy of Sciences] and VILATI are conducting important background industry and research and development activity in the interest of producing robot subassemblies (but not yet satisfying the needs in the entire spectrum). Even today there is a shortage of many background industry products (for example, drives, motors, cables, etc.).

At present about 50-60 robots and manipulators are used at domestic enterprises and institutions. The robots being used differ from one another in regard to source of acquisition, technical level and use area.

Recognizing the significance of robotics and bringing in a number of experts a state action program for starting the use and manufacture of robotics was prepared in the Ministry of Industry. The program--which does exist, in contrast to the statements of an earlier newspaper article which caused rather great indignation among those in the know--also contains a significant degree of central support or economic incentives for the spread of robotization. It defines the tasks for 1986-1990 in the interest of development, manufacture and use of industrial robots and manipulators. It gives a comprehensive, systematic picture of the prospective trends and goals. It designates the research, development, manufacturing and use areas and tasks for industrial robots and provides a circumspect examination of the conditions for carrying out the tasks indicated up to 1990 and up to 1995. And, naturally, it does not ignore the coordination of domestic (enterprise, institution) and international cooperation needed for implementation. Thus, for example, it is

closely linked to the development goals of the complex program of CEMA up to the year 2000.

As for robot manufacture, we naturally must keep in mind that Hungary is in no way capable of autarky--not in robotics either. So, relying on the existing traditions, we should bring into our plans a few well selected types and subassemblies. This might involve the production of robots with high technical ability primarily suitable for technological tasks, machine serving robots (manipulators) to replace physical work harmful to health and robots to serve various tools of production. We want to obtain a few types of assembly robots, subassemblies and background industry equipment by means of international cooperation.

The manufacture and use of robots is a developing process constantly being renewed not only in Hungary but also in countries more economically developed than we. The perfection of the robots themselves (moving systems, grasping tools, sensors, increasing the level of "intelligence", etc.) involves very many problems awaiting solution and requires significant research and development expenditures. The use of robots, integrating them into flexible manufacturing systems and production processes without people, is also an area demanding research and development. So it is understandable that research and development is an important part of the action program dealing with robotization.

Of the nine technical programs of the National Central Research and Development Plan (OKKFT) starting in the Seventh 5-Year Plan one of the most important--including their financial assets too--is the one titled "R&D Tasks for the Automation of Manufacture, Electronic Devices Connected With Precision Engineering and Their Production" and bearing the designation G/6. This has five subprograms, and one of these has as its goal the complex development of robotics.

The partial tasks are varied also:

--Robot research, and within this the realization of a mechanical view which blends precision engineering and electronics, is one of the most important;

--Another has as its goals product and manufacturing development for robots, creating new, further developed versions in addition to manufacture of the existing robot types, purchase of licenses or their adaptation, planning manufacture of parts and subassemblies and satisfying concrete needs;

--A third task is building up model systems, use of systems-oriented planning, collecting experience regarding the functional and quality parameters of robots, professional training and further training and forming awareness.

It is very important to note, however, that the subprogram of the G/6 program dealing with robotics does not make development a goal in isolation but rather in close interconnection with the other subprograms. It is especially essential that the task of an entire subprogram is training, aiding the replacement of experts needed to lay the foundations for the new technologies. It is already well known from the history of computer technology that the most

important criterion for efficient, really useful applications is creating a suitable professional culture or receiving medium. In reality this intellectual process requires more attention and energy than is needed to create the device base because without it even the best program is not worth much.

So we have a program and there is interest and demand. In 1983 the Ministry of Industry and the National Technical Development Committee announced a joint competition for robot applications. The extraordinarily great interest showed that the majority of our factories recognized the possibilities offered by robotics, by the automation of manufacture, and wanted to take advantage of them. We want to continue this competition solution in the present 5-year plan--making use of the experiences thus far--primarily in the area of using model systems. We must again take advantage of the possibilities and preferences offered by the economic regulators. It is also very important that we link into international cooperation, that we offer efficient incentive for the realization of research and development tasks and that we create useful coordination among the university research bases, the research institutes and the receiving, manufacturing, using and producing enterprises. If we are able to realize all these factors then we will not only have a program, we will also have worth while results which increase productivity and economicalness. But this will require constant navigation and control, it will have to be watched and we must intervene in time and to the proper degree, bringing in a wide circle of competent experts.

[Unsigned note: "Cooperation"]

[Text] The cooperative development and manufacture of industrial robots occupies a stressed place in the cooperation of the socialist countries. The Soviet Union has been working for several years already on realization of a comprehensive robot development, manufacture and use program extending to many areas of the economy. Between 1981 and 1990 they plan development and manufacture of 50 new industrial robots, 17 new automatic manufacturing lines and 50 robot supplementing peripherals. Similarly significant programs--also supported with central assets--are under way in Bulgaria (manufacture of 3,500 robots in 1981-1985, in 15 types for about 80 use areas), Czechoslovakia (manufacture of 4,000 robots in the 1981-85 plan period, in 18 types), Poland (manufacture of about 20 robot types, partly on the basis of license) and the GDR (manufacture of 900 robots by 1985). International cooperation is especially important for us in this area. Even now we are preparing a number of bilateral agreements, primarily with the socialist countries, including the Soviet Union.

[Interview with Dmitrij Csetverikov, a scientific group chief at the MTA SZTAKI, by Tamas Samathy: "It Sees In A Plane"]

[Text] Significant progress was made in the 1970's in developing the ability of electronic systems to recognize forms, images and sounds. Industrial robots which "see" in black and white are already in operation in the laboratories of American and Japanese researchers working on creating artificial intelligence.

Hungary also is trying to keep up with the progress. The VM-20 form recognition system of the robot and form recognition department of the MTA SZTAKI figured with success at the world's great review of robot manufacturers in Birmingham.

[Question] What does this successful appearance mean?

[Answer] For the time being it does not mean that western businessmen crowded around our stand to sign contracts. We can count it as a success that the system finally worked well at the time of the exhibit and aroused the interest of experts coming from the developed capitalist countries.

[Question] How does the form recognition equipment work?

[Answer] Two ordinary Vidicon TV cameras sense the object as a silhouette. The signals of the black and white raster points go from the camera to the image digitizing unit which codes the visual information into numbers and hands it on as a 256 x 256 resolution matrix to the built-in Z 8000 computer. The processing programs perform various mathematical analyses. Actually it analyzes the contours of the object seen--in our case machine elements or machine parts. It measures the circumference and area, checks the number and location of drilled holes, seeks form characteristics--such as extension and local curvature of the contour--and calculates the orientation of the objects. Then, comparing the various measured and calculated characteristics with data stored in memory (a capacity of 128 or 256 K bytes), it makes distinctions among the objects in the field of vision of the camera. The microprocessor compares the statistical characteristics and then a program decides, on the basis of probability, which object to choose. The equipment can be taught, because one can define in advance those objects which may be involved in the recognition. The memory stores the chief characteristics and decides later, on the basis of them, whether to give the manipulator an instruction to grasp and move the object or give the pneumatic blower an instruction to return to the feeder parts arriving in an incorrect position on the assembly table.

[Question] Abroad they are increasingly using as the eyes of a robot the CCD cameras which give a distortion-free picture.

[Answer] In addition to the very small light intensity these solid state cameras also work without failure. They do not contain heated filaments or fragile parts so they are extraordinarily resistant to vibration and outstandingly suitable for industrial visual form recognition. Stereoscopic or three dimensional recognition is a very complex process; there are only laboratory experiments anywhere in the world now. But our devices see well in two dimensions already and for the time being there is greater need for this in practice. The majority of the tasks to be performed in industry can be solved with two-dimensional vision. It is a deficiency of this design that it can confuse together different parts with a similar projection. So sooner or later we must go on toward use of multiple level images, which requires greater computer and memory capacity. We are already thinking about development of a sort of auxiliary hardware and we are trying to develop algorithms so that when we have a suitable microprocessor we will be able to make it perform the necessary operations.

[Question] What can the form recognition system be used for?

[Answer] In our laboratory we have been able to get the machine to select with great reliability 30-50 parts with different forms; indeed, it senses their placement on the conveyor belt and in case of need it manipulates them by activating the robot hand. The system could be used in a very broad area from quality control through assembly to medical science. The VM-02 is three years old, the result of many steps of developmental work. Later we would like to solve even finer tasks, for example in quality control. If we want to recognize more than crude errors we must deal with image processing capable of evaluating several levels, that is degrees of gray, or a number of gradations. To the extent that this is solved the system could also be used to indicate weaving errors in the textile industry or to continuously check the homogeneity of primary material fibers in the paper industry.

The VM-02 is actually a starting base; it can be developed in accordance with special concrete needs with the available module assortment. The system, every part of which can be obtained from the socialist market, costs almost one million forints. Whether this is much or little can be decided only by industrial experience. Thus far, however, there have hardly been any inquiries....

[Article by "Redel": "A Null Series Soon"]

[Text] One operating reference plant and one robot almost entirely domestically made are not really much in themselves. But if we look at them as the first steps of an undertaking to fill a gap then we must evaluate them differently.

An unusual decoration on the desk of Laszlo Zarai, technical director of the Csepel Custom Machine Factory, attracts attention to itself--a formless piece of metal about 20 cm in diameter which even looks like it must weigh a good deal.

"The first victim of the robot plant," the technical director explains, "the finger of a robot. The hammer press cut it off in a bad cycle...."

Later when I was looking at the model system of the Japanese Daido firm at the Iron Works, and the forging machine beside it being fed traditionally by a human, the deformed robot finger came back to mind.

The Csepel Custom Machine Factory has purchased from the Daido firm the license for a complete family of products. The load capacity of the point controlled robots goes from 30 kilograms to one ton. They can manufacture robots in two versions, cylinder coordinate (HS) or articulated (HD). In the model system working at the Csepel Iron Works two robots, still the original ones of Japanese manufacture, serve the hammer and composing presses. The Daido experts developed the technology for the two reference pieces; the domestic experts used the experiences of these when developing the product. If a robot is to "live" then, depending on the task, there must be technological

and design modifications and, naturally, continual material supply must be ensured at all times.

So far they have "taught" the robots tasks to be performed in producing seven types of products. But they have not yet succeeded in achieving the optimum manufacturing cycle times. Problems are caused by a precise setting of the squeezing strength of the robot graspers and by development of various peripherals and auxiliary equipment.

The prototype of the first HD type electrohydraulic controlled robot has been prepared at Csepel, but the ratio of imported parts is still very high. At present Danuvia and Vilati are proceeding well with realization of an entirely domestic electrohydraulic control and the Custom Machine Factory has already finished the mechanics. Null series manufacture can begin soon, which is urgent for the factory because it has orders for the HD 500 type. They are preparing to make 10-15 robots per year. This family of hydraulic robots could lay the foundations for noteworthy export, its larger versions with load capacities above 1,600 N are still without competition in CEMA and through them perhaps we have found, if late, a gap and can have a role on the robot market.

[Article by "M": "Finnish Robots with Hungarian Sensing Organs"]

[Text] A significant group of Hungarian experts dealing with robotics received an exciting opportunity in 1986.

The Computer Technology and Automation Research Institute (SZTAKI) of the Hungarian Academy of Sciences signed a 3 year cooperation agreement with the Tampere Technical University (TUT) on the basis of which a vision module and force sensors made in Hungary will be fitted to the robots of the Finnish NOKIA firm, and they will develop control software to solve jointly chosen industrial tasks. They will create an identical intelligent robot system in each country; the Finns will deliver the robots for these and the Hungarians will deliver the sensors.

Participating in the scientific exchange will be IKARUS (as the first industrial user of the solutions, and a future user in case of success), the machine manufacturing technology faculty of the Budapest Technical University (as designer and implementer of the applications solution) and the MOM [Hungarian Optical Works] Kaliber Factory (which will provide the six component pre-sensor).

The Finnish NOKIA firm will deliver the robots used in the experiments in the hope that, as a result of the cooperation, they will create intelligent robot assembly work stations which can be sold as finished units.

The development is being supported in Hungary by the National Technical Development Committee (OMFB) and in Finland by its partner there, the TEKES. The OMFB has signed an experimental development contract with IKARUS as industrial user.

[Unsigned note: "REKARD on the World Market"]

[Text] The REKARD firm in Gyor has developed successful cooperation with the Austrian IGM firm. The protective gas arc welding manufacturing cell purchased from the IGM as a model system has been working perfectly for 3 years. A two-armed welding robot works in this cell. Within the framework of the cooperation REKARD manufactures parts and subassemblies which appear on a number of world markets built into products of the IGM. REKARD has also obtained a license for a modern articulated arm welding and flame cutting robot. It has thus prepared to manufacture a product comparable with the progressive world level, a product which up to now could be obtained only from the capitalist market and with which it becomes possible to develop complexly automated arc welding work stations and complete manufacturing systems using robots.

[Article by "-sthy-": "An International Training Center--Here At Home"]

[Text] It is true that Hungary is not among the great powers of robot manufacture but it does have useable intellectual capacity in this area. The International Robotics Center formed--as a UNESCO organization--in the Mechanical Engineering School of the Budapest Technical University has created a good opportunity for Hungarian scientists to receive a greater role than heretofore in research and development on robotized systems and in passing on information connected with their use.

In the recent past the robot center organized a study course for young university instructors and researchers from developing countries. The participants became acquainted with the theory and practice of robotics, visited the computer technology laboratory of the Hungarian Academy of Sciences and studied the hot plant application of the DAIDO manipulator at the Csepel Works. They watched the operation of welding robots at the Bicycle Factory of the Csepel Works, at REKARD in Gyor and at the Budapest factory unit of the IKARUS Body and Vehicle Factory.

The Paris center of UNESCO considered the first study course successful and at its request the mechanical engineering school will repeat the course this fall. The university will also use the study materials collected for this purpose in Hungarian language robotics instruction. Such instruction starts this February in the mechanical engineering school as an experiment with a small number and in 1988 they hope to introduce Russian language robotics instruction for those Soviet citizens who have done their first 3 years in the Soviet Union and then will receive 2 years of robotics training at the Budapest Technical University.

[Unsigned note: "A Broad Offering"]

[Text] The offering of the Soviet robot manufacturing industry continues to expand. For example, new products include devices to automate positioning operations on punching presses, robots to automate loading operations and the so-called suspended track equipment which can be connected to assembly and processing machines. They manufacture robots for numerically controlled lathes and grinders and the universal milling robots can be used on sheet stamping

machines, for assembly jobs, for welding, for mechanical processing, for casting and in plastics manufacturing processes. The large capacity industrial robots installed in Soviet processing centers already constitute complete flexible production systems. Recently Hungarian enterprises also have purchased robots and the Hungarian machine tool industry is offering on third markets a number of processing centers and machine tools supplemented with Soviet robots.

[Article by Samathy: "A Robot Takes a Test"]

[Text] In the laboratory of the machines and mechanics faculty of the Donat Banki Machine Industry Technical College they are testing the robot which the Csepel Custom Machine Factory produced on the basis of a license from the Japanese firm Daido. For the time being the hydraulics moving the apparatus and the electronic controls are Japanese products, only the mechanical part and the arm and body made of steel sheet are made in Csepel.

The scientific recording of the measurement results obtained in the course of the testing will serve as a starting point for a later development. With the present controls the machine, equipped with a grasping head, is suitable for serving a machine tool, moving material, repositioning workpieces, palletizing and loading into containers. The further developed version will be used to do hard physical work harmful to health and to clean castings.

In the course of the analysis they measured the geometric characteristics of the HD-200 arm. They were checking to see if it was really capable of 240 degree movement and how it worked in a work space of 2 x 2 meters. They were checking whether horizontal movement was radial in relationship to the turning center of the arm and whether vertical movement was parallel to the turning axis of the robot. By measuring the positions of the arm they were seeking an answer as to whether the so-called point controlled robot, operating without sensors to sense the external space, "remembers well" the spatial points "taught" to it in advance and how precisely it approaches them. The specification prescribed plus or minus one millimeter, and the measurements gave better results than this. They also studied the kinematic characteristics--in the classical physical sense--of the movement of the arm, which has three speeds. They measured the various speed values, the step time and the entire cycle time when starting, stopping, accelerating and slowing down. They tested the programability of the robot--how complicated it is to operate and whether it can execute the instructions. The results are favorable. The device is operated by a hydraulic power unit with a permanent pressure of 150 bar; the required performance and speed can be attained by changing the fluid flow. They measured the fluid flow, temperature and pressure during operation.

Safety tests showed that in a dangerous situation the robot immediately stops in its position of the moment, the elements preventing pipe breaks guarantee that heavy workpieces will not be dropped, and in the event of a technical failure it cannot cause an accident. They also measured the static and dynamic characteristics of the arm. They measured the latter with two test devices; they transmitted the vibrations created with an electromagnetic membrane shaking table to the end of the manipulator of the robot by means of a piano

wire while shaking the head at various frequencies. They measured the acceleration produced and determined the movements from this. The other method is simpler; they "tapped" the robot with a half kilogram hammer and recorded the head vibrations with a digital signal recorder. When designing the robots to clean castings they will be able to calculate from these data at what frequency swinging or vibration will be caused--for example during grinding. Vibration dampers will filter out the damaging movements.

The robot passed the tests well, the measured results are satisfactory; our domestic concitions make manufacture and further development possible.

[Unsigned note: "Polite"]

[Text] The Bulgarian robot called the Robco-9 greets the guest and offers him a seat and coffee. More than 100 programs have been loaded into its memory unit and thanks to its modular design its program can be expanded continuously. On the basis of numerical programs loaded in advance it carries out its tasks punctually by day and hour. This "intelligent being" speaks fluent English as well as Bulgarian.

PHOTO CAPTIONS

1. p 6. The result of the cooperation of REKARD and the IGM--a welding robot.

2. p 6. The robot of the Csepel Custom Machine Factory passes the test.

8984
CSO: 2502/39

EAST EUROPE/LASERS, SENSORS, OPTICS

LASER DEVELOPMENTS IN BULGARIA DESCRIBED

Sofia OTECHESTVEN FRONT in Bulgarian 5 Apr 86 p 8

[Discussion conducted by Andrey Nedyalkov and Paun Tsonev: "The Laser Beam is 'Piercing'"]

[Text] Bulgaria is asserting its name among developers of optical electronic and laser technologies and system.

In recent years optical electronics and laser technologies have been among the fastest areas of development of scientific and technical progress. Their accelerated development and steady broadening of the area of their application are due to the exceptional possibilities resulting from generating, transporting and receiving light radiation. Their application covers the virtually entire range of human activities: industry, communications, agriculture, medicine, science, etc. The following example illustrates the unique qualities of the laser beam: it can generate a temperature of 20 million degrees C, compared to the temperature of the sun which no more than 7,000 degrees.

A comparison between processes based on traditional means and laser systems proves, as a rule, the following advantages of laser technology: high productivity, fewer production costs and higher quality; successful solution of problems and achieving the necessary technical results unattainable by other means.

For nearly a decade various institutes and organizations in our country have actively worked in various laser areas. Today optical electronics and laser technology have asserted themselves as one of the main strategic trends of the technical revolution in our country. Last year the Council of Ministers approved a national program for their development. The theses of the 13th BCP Congress paid particular attention to the need for their accelerated development and application. We learned greater details on problems resolved currently in our country in these areas by talking to Mikhail Tutekov, secretary of the National Council on Optical Electronics and Laser Technology:

Bulgaria is a small country. Nevertheless, we are among the few industrially developed states which have achieved definite results in the use of lasers. The first laser was demonstrated in 1960 by the American Doctor (Mamun). Only

4 year later we conducted a successful experiment in this area. However, the first firm steps taken in Bulgaria in conducting purposeful and systematic work related to optical electronic and laser technologies were taken after the July 1978 BCP Central Committee Plenum. Naturally, our scientific potential does not permit us to develop problems in all areas of laser instruments and technology. That is why our national program includes nine main areas. Here are some of them: laser technologies and systems for use by the national economy, optical fiber communication systems, optical memory systems and optical electronic transformers. We are paying great attention to the development of laser sources, optical fibers and cables, laser elements and crystals, optical electronic structural elements, etc. The targets we have set ourselves are most clearly expressed by the fact that we have 293 assignments on the development of essentially new items and systems of a multiplication nature, for use by the national economy, and of technologies which will ensure higher technical production standards in Bulgaria. Our most significant successes are the creation of high-power SO-2 lasers. They are used in metal processing technologies, in cutting, drilling, welding, heat processing, etc. In this area we lead the socialist countries. Even the USSR purchases from us systems based on laser technology.

Actually, the production of optical electronic and laser equipment is developing dynamically and rapidly in our country. The total output tripled between 1984 and 1985. We are expecting the same growth rates this year as well. Our national program will be carried out with active scientific and technical cooperation with the USSR and the other CEMA members and extensive use will be made of progressive foreign experience.

Yes, our cooperation with Soviet scientific organizations led to the development of a copper steam laser, the RUMO system for growing crystals, technologies for spinning optical fibers, technology for the production of optical quartz, glass, etc. We shall develop some laser and optical fiber systems in close cooperation with Soviet consumers. The CEMA program for the development and application of light conductor means for data transmission assigns Bulgaria a leading position in the area of local systems.

The development of optical electronics and laser technology in our country has taken place in several centers: Plovdiv, where a large specialized unit has been created--the Scientific-Production Optics and Laser Technology Enterprise; Sliven, with the Svetlina NPSK, which is the national technological center for deep quartz processing, and Sofia, where new laser systems, devices and sources are being developed at the Bulgarian Academy of Sciences, the VUZs and their laboratories and the Optika NPK. Since the extensive use of lasers is still being held back by their high price, low efficiency, insufficient knowledge of the interaction between the laser beam and the processed materials and many other important reasons, we must establish the clearly defined interconnection between production possibilities and an economically efficient limit in the development of such systems and technologies, which is particularly important for a small country such as Bulgaria.

Other problems exist as well. We are short of skilled specialists in this area. This forced the competent departments and organizations to draft a

program for the organization of new forms of training and upgrading the skill of specialists. Some engineering and natural science subjects will acquire a new content. New postgraduate training courses will be offered.

Furthermore, a number of economic managers have not become attuned to the use of optical electronic and laser systems in their work. The faster this conservatism is surmounted the greater will be the effect of the utilization of such latest achievements of technical progress in the national economy. Today, for example, according to the specialists no new quality leap in microelectronics is possible without mastery of laser methods in basic production processes, such as heating, epitaxy and ion implantation. The same applies to progress in modern biology, photochemistry and spectroscopy.

The development and perfecting of lasers made radical changes in control and measuring devices and systems. Instruments which measure and control roughness, vibration, mechanical stress, microdefects and others, provide the type of accuracy which in the majority of cases cannot be achieved through other means. Modern medicine as well is "in a hurry" to make use of lasers in surgery, neurosurgery, stomatology, faster healing of wounds, and treatment of skin diseases. The laser is penetrating every where.... Briefly stated, it has penetrated our future.

5003
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EAST EUROPE/METALLURGICAL INDUSTRIES

ROMANIAN COMMENTARY ON GDR POWDER METALLURGY CONFERENCE

Bucharest METALURGIA in Romanian No 38, Jan 86 p 54

[Report on the Eighth GDR International Powder Metallurgy Conference by P. Herscovici]

[Text] The Eighth GDR International Powder Metallurgy Conference was held in Dresden on 24-26 December 1985.

This scientific meeting was organized by the Central Institute for Research in the Physics of Solids and Materials, of GDR Academy of Sciences. Participating in the organization of the event were specialized members in CEMA (Kiev) and the GDR Physics Society.

The topic of the conference was "Materials Obtained by Powder Metallurgy Techniques. Fundamental Principles, Formulation, and Properties."

The aim of the conference was to present theoretical and experimental contributions to pressing and sintering processes, to disclose relationships between materials structure and the properties of sintered parts, and to discuss future objectives. The program included papers on materials sintered from iron powders, the metallurgy of powders, high-speed steel, friction and frictionless materials, hard alloys and superalloys for tools and special parts, as well as ceramic materials.

Due to the comprehensive and varied nature of the topics, the papers were divided into the following categories:

Scientific principles of powder metallurgy;
Powder formulation and pressing processes;
Theory of sintering and sintering processes;
Structure and properties of sintered materials;
Hard alloys, hard metals, and ceramic materials.

Two round tables on the topics "Progress in Sintering Theory and Practical Applications" and "Cutting Tool Materials" were respectively chaired by F. Thammler of Karlsruhe and by P. Ettmayer of Vienna.

The topics of discussions around the poster sessions also covered powder production and pressing, sintering theory, structures and properties of sintered materials, as well as metal and ceramic hard alloys.

Some of the theoretical and production papers presented were:

"Recent Results Obtained With an Activated Sintering Process" (W. Sohatt of the Dresden Technical University). Experiments were conducted in a Cu-based system; the paper discussed the positive effect of W-Ni elements on technical parameters of the sintering phase.

"Developments in Powder Metallurgy Production at the VEB-EHW Thale Plants" (B. Reichmann of VEB-Eisen und Huttenwerke, Thale). The author offered a number of production indicators for 1985 in the fabrication of iron powders.

He mentioned the advantages of water-jet crushing, as well as the research being carried out at the Dresden Technical University to improve the process; the process yields higher specific weight (7 g/cm), high purity, and reproducible iron powder quality.

Materials sintered from iron powders were the topic of papers that elicited technical and scientific interest, covering plastic deformation and friction properties, as well as the relationship between microstructure and fractographic properties. Some of the titles were:

"Theory of Plastic Deformation of Porous Sintered Materials" (P. A. Vitjas, V. K. Seleg, et al. of Minsk, USSR) Traced the transformation mechanism of volumes occupied by pores during deformation operations.

"Traction and Friction Resistance of Materials Sintered from Iron Powders" (I. M. Fedorcenko, A. E. Kuscevsky, et al. of Kiev, USSR). Gave the results of interesting experiments, particularly the critical factor Kic, which determines the correlation between physico-mechanical and friction properties.

Several papers were presented on the fatigue resistance of products sintered from iron powder, as well as the fragility of these materials. Some of the titles were:

"On the Fatigue Resistance of Materials Sintered from Iron Powders" (B. Kubiki of Warsaw, Poland). Knowledge of the contraction mechanism and size of pores is considered essential; a statistical analysis model was described.

"Structure-Resistance as Model for a System to Determine the Ductility of Sintered Materials" (S. Siegel and W. Hermel of the Central Institute for Research in the Physics of Solids and Materials, of the Academy of Sciences, Dresden, GDR). Numerous figures illustrated the theory of this model.

Some of the papers covered sintered steels. Among them were:

"Recent Research on Weakly Alloyed Sintered Steels" (F. Thuler and R. Oberacher, of Karlsruhe). Laboratory analysis of the effects of Mo, CrMn, Mo-V-Mn, Mo-Mn, and Si-Mn content on steels.

"Determination of the Superelasticity of High-Speed Steels Obtained by Powder Metallurgy" (M. Sorsorov, T. A. Cermysova, et al. of Moscow-Tula, USSR).

The results of many studies of hard alloys based on WC and on TiC were presented. Among them were:

"Influence of Structure on the Properties of Hard Alloys Sintered from WC-Co" (J. Dusza and L. Parilak of Kosice, Poland).

"Use of the K10 Fracture Resistance Coefficient as Criterion for Optimizing Applications of WC-Co Hard Alloys at Different Temperatures" (N. K. Konovalenko of the Materials Institute, Kiev, USSR).

"Hard Alloys Based on Titanium Carbonitride" (K. Muller and A. Berger of Dresden). The paper was complemented with an illustrative chart that compared the steel cutting behavior of various hard materials based on WC to those based on TiCN.

"Deformation of Hard Materials at High Temperatures (M. Komak and S. Novak of Lyubliana, Yugoslavia). The paper presented experiments on the behavior of TiC-Mo-Ni alloys at temperatures of 800-1000 C.

The work displayed during the poster sessions was grouped into the following categories: powder production and pressing, theory of sinterization process, material structures and properties, hard alloys, hard metals, and ceramics.

The discussion generated by the round table on the topic "Materials for Cutting Tools," led by P. Ettmayer of Vienna, was carried out a high level with indications of present orientations in the specialty.

The Romanian delegation participated in discussions associated with papers on hard sintered alloys, presenting achievements in the use of such materials for ball bearing production.

All the above indicate that the conference covered a broad range of topics, powder metallurgy currently being used in various areas, both for fabrication and in industrial applications.

Although considered as conventional products, materials made from iron powder--raw materials, technical processes, applications--continue to be the focus of research in GDR, CSR, and USSR, emphasizing the formulation of new high-speed and alloy steels, thus confirming that Romania's long-range research program is correct.

Discussions in the area of hard alloys covered the interest in system to improve the control of processes in the sintering of WC-Co alloys, as well as in the development of compositions based on TiC, as partial substitutes for those based on WC.

Isostatic pressing is now a necessary process, having been adopted by the majority of countries; the construction of appropriate equipment in Romania is being encouraged.

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CSO: 2702/12

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

POLICY, STRATEGY OF BULGARIAN SCIENCE ACADEMY

Sofia SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE in Bulgarian No 6, 1985 pp 10-16

[Article by Senior Scientific Associate Boris Bradinov: "Strategic Planning of Academic Scientific Activities"]

[Text] Long term scientific developments have always been a guiding factor in the creative efforts of scientists. Over the past 20 years the use of the influence which the future has on the present--scientific planning--has become more complex and so strong as to become one of the main functions in the scientific policy management of scientific institutions. Our national scientific front and the Bulgarian Academy of Sciences, as the largest scientific organization, are a good example of the implementation of this trend under in a small European country. A great deal of strategic farsightedness has been noted in organizational transformations, topic planning, shaping the scientific potential and territorial cooperation among academic scientific units. Further efforts must be made to enhance the productivity of national basic research and increase its practical usefulness.

Identifying and utilizing national specifics of targets and means are real problems of scientific strategy in all countries. Countries which are small from the demographic and resource viewpoints and which are not only under the influence of global scientific processes but of leading scientific centers are forced to use some of the advantages of their peripheral positions. The concept has developed of late that the limited nature of resources for scientific activities could be surmounted by choosing an accurate national strategy both within science as well as toward it. Making use of specialization, international scientific cooperation and high research mobility, balanced investment of resources and the "time" factor, a small country can create and maintain the necessary potential even for highest quality research.

It became particularly clear during the 8th 5-Year Plan that in a country such as Bulgaria the simultaneous development of strong science and pursuit of intensive research objectives demands the elaboration of an essentially new type of planning and management activities on all levels of the scientific front. The February Plenum resolutions appeared to meet precisely such requirements.

From the viewpoint of the new requirements concerning planning, the guidance of scientific development of academic institutes must be enriched and perfected strategically. In our view, particular attention should be paid to designing and building the intra-academic system for strategic management of basic research and overall BAN scientific activities. Within a short time, as early as the 9th 5-Year Plan, we must surmount the existing lagging behind needs and standards in the area of strategic planning. The overall objective of all measures was given by the February Plenum: ensuring the functioning and development of academic institutes on a self-regulating basis.

BAN scientists and collectives must become co-authors of the academy's new scientific policy and continue to ensure the relevant target orientation and selective structuring of the academic plan with a view to providing scientific support for strategic national objectives. The object of strategic planning is to develop the scientific potential (a strong science) and, particularly, cadre strengthening and the drastic improvement of material facilities for research and development. Strategy must also be applied in planning the BAN's international scientific cooperation, so that this may develop into a truly essential resource for national basic research.

In addition to further strengthening the self-management of scientific collectives and organizations which, in a certain sense, already exists, planning must be based on a new logic as well. By this we mean the organized conversion to adaptive planning of academic scientific activities as a reaction to the new requirements for controlled flexibility of research processes. With the help of planned corrections, adaptive planning should ensure the implementation of the main objectives of program and permanent scientific units within the conditions of dynamically changing external influences.

Compared to other adaptation mechanisms, adaptive strategic planning offers the advantage of providing a faster active reaction, backed by analytical and forecasting information. We are also familiar with some specific strategies for resource investment, which guarantee the preservation of the maximal freedom of choice in selecting areas of scientific development. As an exceptionally complex management activity, strategic planning must be based on a proper scientific foundation. Let us emphasize that for the time being no such foundation exists or more specifically, the efforts to borrow concepts, technologies and mechanisms from economics, politics, military planning, etc., failed to yield significant practical results. Today developed, "borderline" and developing countries are doing a great deal of work to sum up and assess "living experience" with a view to finding approaches and technologies relevant to the scientific spirit ("UNESCO Statistics on Science and Technology," December 1980; OECD "Reviews on National Science Policy. United Kingdom and Germany." Paris, 1967; UNESCO, "Science Policy Studies and Documents, No 17, National Science and Technology Policies in Europe and North America, 1978." Paris, 1979).

The condition of planning in the large organizations on our scientific front, such as the BAN, Kliment Okhridski Sofia University, the Medical Academy, the Agricultural Academy, and some higher educational institutions is of interest for it contains spontaneously developed mechanisms for strategic management,

which could be developed further. Almost without exception they are based on the intuition, knowledge and prestige of our great scientists. This will no longer suffice in the immediate future. Their intellectual energy must be supplemented and strengthened with the help of special information technologies. The formulation of the draft 9th 5-Year Plan indicated that in addition to internal organizational factors the quality of planning greatly depends on proper organization on the national level. According to the technology used in our country's planning practices, each 5-year period of planning includes activities on shaping long-term strategy. For the next 5-year plan, scientific and technical forecasts are being systematically formulated along with a national comprehensive program for science and technical progress and state scientific and technical programs based on it. The latter are the programmatic part of the new 5-year plan.

The program for the development of basic research, which is a complex conceptual document which earmarks the main trends of scientific and technical development on the basis of fundamental research, plays a leading role in the strategic long-term development of our national science. In particular, in terms of the BAN system and, with some specifications, the other academies as well, the formulation of a strategic conceptual document means identifying the strategic problems in our scientific development and earmarking topic trends and resource-organizational means for their implementation.

Strategic planning within the BAN system could be described as structural activity and a process. Formally interpreted, it consists of the following elements: objects, planning subject, planning documents (concepts, programs), planning technologies and a resource activity base. One of the most difficult problems is the choice of strategic management targets. In terms of its purpose, this type of management is aimed at promoting significant and lasting changes in the object, which requires more time. The efficiency of long-term plans is determined not by their detailed nature but their potential impact on lasting characteristics of scientific activities. The conditions of revolutionary dynamics of scientific and social development changed concepts relative to the strategic significance of specific science activity units. Until recently it was believed that the lower limit of strategic processes was the institute level and that its structural subdivisions had no right to have their own strategic initiative but served the overall long-term objective of superior levels. Today in a number of new problem areas, biotechnological research for example, the problem group and section also assume strategic importance in terms of national science.

The strategic significance criteria and, consequently, the criteria governing the choice of strategic planning targets, are becoming increasingly relative. In addition to the absolute indicators of durability, organizational dimensions or scientific potential, system-structural indicators are used, detailing the "contributory" significance of specific scientific activities aimed at reaching the higher strategic objective. In all likelihood, the broadening of strategy in BAN activities is the consequence of the comprehensive nature of the problems it is solving. The study of existing forecasts on the development of basic research until the year 2000 also enabled us to bring to light likely long-term interactions among problem areas

("Basic Research in Forecasts for the Period Until the Year 2000." AKTUALNI PROBLEMI NA NAUKATA, No 5, 1983).

Naturally, the approach to the choice of strategic development targets we are discussing, from the mesolevel of the BAN or the macrolevel of the national scientific front, should be expanded by adding the position held by the scientific collective. The individual plans of its members constitute the "microstrategic" level, which does not necessarily coincide with the role assigned to them in the efforts of the institute to reach the desired target. This leads to the appearance of processes which resemble familiar games with noncoincidental interests. It could be expected, therefore, that a strategy exists on all organizational levels. However, because of the different subjects of activity, the self-regulating processes assume the additional features of competitiveness, counteraction or coalition.

The study of a new complex problem area conducted by the Center for Scientific Knowledge indicated that intrascientific strategy greatly depends on the strategy of the state regarding basic science. A very essential fact here is that funds appropriated for academic scientific research do not currently depend on the needs and possibilities of science and material production but almost exclusively on national budget appropriations. The specific financial possibilities, superimposed on specific features of the potential of research collectives, lead to the development of some "standard" strategies, as follows:

a. In areas of science where no more than a minimally necessary qualitative level of results is possible, the so-called targeting strategy is practiced. This means asserting a scientific novelty on a national scale and proving the eventual applicability of results;

b. Ensuring stable positions, which is achieved by the stronger collectives and is aimed at coming closer (in terms of topic and potential) to the average level of similar foreign organizations working on similar problems. Here the rating is based on indicators of collectives which maintain the same "distance" from the leading edge of research in their area for the same period of time (5 years, for example). This leads to strategic stability by reducing the risk assumed by the leaders.

Basically, strategy in academic scientific activities is dynamic. In a number of cases it also meets the requirement of adaptation. Thus, the first two lines of behavior could be described as passive adaptive, for they are based on making changes within the research collective itself under the influence of external factors. The other types of strategies used in our practical work are active adaptive. They offer greater freedom of choice of target, great maneuverability with the scientific potential of the unit and the possibility of choosing coperformers. This behavior (activeness), however, is more "costly," in terms of unplanned losses of time and confidence.

c. The active strategy is chosen by collectives who aspire to come nearer to leading positions. In this case, the self-evaluation standards are the results and organization of the best, the leading institutions, the "breakthrough" trends of research in the area.

d. Aspiration to leadership means striving toward scientific novelties and unattained indicators of scientific productivity. Examples of this may be found in our academy and they deserve the fullest possible study.

The main product of strategic planning is the elaboration of a concept on the development of a specific scientific area. This administrative document is an assessment of the level reached and expresses scientific predictions on the basic trends of development of the area, which are to be followed with the plans drawn up for the corresponding period. The elaboration of concept of the development of scientific activities within the BAN system is based on broad forecasts. At the forecast stage, using proper technology and forms of presentation of forecast data, the following step in strategic planning is prepared: the program stage. Stipulating the targets of the program for the development of basic research is a specific assignment of specialists in the corresponding scientific area. In addition to the fullest possible familiarity with the nature of the scientific problems, they must also be familiar with specific activities in the same area. The scientists shape the strategic future of their research in a way similar to technologies governing scientific activities, by including standard scientific communication mechanisms. Taking into consideration the natural continuity of research processes, the formulated concepts must be consistent with changes in priorities demanded by superior management levels.

Defining the concept targets means giving a specific scientific-organizational content to the standard structure of the desired future development of the scientific area and to part of the information structures (planning documents) formulated on a higher level. This system for the organization of the strategic long-term development is based on two levels of targets and, respectively, structures: by scientific area and the so-called general scientific level.

Furthermore, it is stipulated that the strategic description of each separate scientific area to be structured on the basis of comprehensive problem areas, cooperation among the scientific disciplines which will be developing them, and the international division of labor; it must be divided into parts to be developed by permanent organizational structures or program collectives.

The long-term developments of each specific scientific area must be presented as a process. This means that the targets of strategic planning--15 or more specific long-term developments in BAN basic research--involve not only conditions, results and amounts of resources but also trends of processes, the dynamics of strategic priorities, variants and reserves.

Bearing in mind that strategic plans (concepts) lack the details of annual planning documents, attention must be focused mainly on achieving balanced long-term developments for each scientific area. In more specific terms, this means the following:

The relevance of the problem-topic area for the period of the 9th 5-Year Plan and, in a number of cases, until the year 2000.

The possibility of the fullest possible description of resources which, in the view of area specialists, will be necessary for the development of the strategic problems;

Description of the effects of the selected strategic long-term development, which means, as a minimum, to indicate scientific and other practical areas and social processes which could be influenced by results. In some cases, despite the lack of definition of basic research, scientists will be able to contribute to achieving strategic state NTP targets.

The degree of balancing depends on the utilization of the various opportunities of the "target-means-result" system. In the initial period of the 9th 5-Year Plan an influence of the inertia of scientific development, embodied in qualification and some other material components of the existing potential, is likely. In organizing a balanced long-term development, it is necessary to determine the correlation between this inertia and the new processes; an end must be put to existing phenomena of topic "supercontinuity" or low-potential topics, manifested in the scattering of scientific personnel and material facilities among problems in the solution of which they do not constitute a "critical mass."

Balanced prospects in the development of a specific scientific area presume the concentration of potential in accordance with the latest principles of selective organization of scientific activities and the concentration and priority rating of problems in time. Real possibilities exist of using the multiplication possibilities of new ideas, knowledge and information inherent in basic research.

The extent to which the specific scientific unit will be able to attain the strategic objectives expected of it depends on whether or not it will succeed to develop a corresponding problem-oriented potential during that period. For example, if a successfully working scientific institute is assigned an essentially new scientific problem, its collective will undertake its effective development only after it has adapted its own subsystems to the new set of problems. Bearing in mind the importance of the flexible handling of scientific potential in contemporary scientific work, the assessment of the problem relevance becomes an important element of scientific strategy (Dobrov, G.M. and Tonkal, V.E. "Comparative Analysis and Estimation of Competence of Research Units." SCIENTOMETRICS, vol 7, No 3-6, 1985). In considering the need for greater mobility of scientific collectives and of individual scientists, we must remember that these qualities are costly in terms of the time for redirecting and retraining, drop in the pace of scientific productivity, loss of competence, etc. For that reason, the strategic management bodies must be well-familiar with the adaptive possibilities of the specific units and, wherever possible, try to adapt scientific knowledge already extant in the scientific treasury rather than change the problem orientation of the collective. The processes of synthesizing existing scientific knowledge offer particularly great advantages in so-called technologically oriented academic research. Suffice it to mention that by 1980 more than 60 percent of the BAN cadre potential were engaged in technological research.

Strategic planning technologies must meet two groups of requirements which stem from the functions of conceptual developments in managing scientific activities. Above all, they must be consistent with the features of scientific management on the level at which strategic activities will take place. BAN planning practices have indicated that separating problem-topic from resource planning for scientific activities is mandatory. Strategic planning technologies must be such as to ensure the inclusion of everything necessary for reproducing scientific activities in basic problem areas.

The second requirement is for the structure of the targets subject to strategic development, in reflecting the contemporary principles governing our national scientific policy, to provide adequate scope for scientific creativity. This requirement is the practically concretized expression of the self-regulation principle.

In defining the specific project and the meaningful formulation of the standard strategic structure, we must bear in mind above all the selective organization of priorities in the national scientific front. That is why, in some cases we must abandon the development of already forecast scientific areas.

The attitude toward strategy in scientific activities and, particularly, strategic scientific planning, must become the expression of the intensified concern for national basic research by all state and economic bodies and organizations. The latest stipulations on linking the scientific and technical revolution with socialist social development in Bulgaria, formulated at the February Plenum, demand intra-academic efforts to be firmly backed on the macrosocial level. The new policy in the area of basic research will be the concern of the three scientific front subsystems. However, in terms of the largest national organization in charge of basic research, such as the BAN, a special strategy must be formulated for the faster development of its potential. This is a secure prerequisite for the implementation of its stressed scientific functions within our overall socioeconomic development.

5003
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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

DIRECTOR DISCUSSES ACTIVITIES OF GDR NUCLEAR INSTITUTE

East Berlin SPECTRUM in German No 1, 1986 pp 10-13

[Interview with Prof Guenter Flach, director of the GDR Central Institute for Nuclear Research, on a visit to the editorial offices of SPECTRUM, moderated and recorded by Elisabeth Manke: "Energy From the Microcosm"; date of interview not given; first paragraph is SPECTRUM introduction; boxed material as indicated]

[Text] The era of nuclear research and its peaceful use began 30 years ago in our republic with the construction of the Central Institute for Nuclear Research in Rossendorf. At that time neutrons and protons were considered "elementary particles." Today experimenters and theoreticians work with their components.

[SPECTRUM]: The Rossendorf facility began its work as the Central Institute for Nuclear Research 30 years ago. Since 1957 the first GDR research reactor has been in operation there. What was the significance of that for basic research at that time?

Professor Flach: On 14 December 1957 the last step in the construction of the first GDR research reactor occurred. The fuel assemblies containing uranium entered the active zone. Would it be successful? The critical condition was reached for the first time. A memorable day! With suspense a small group of colleagues of our institute closely observed how the neutron stream of a neutron source introduced into the active zone intensified increasingly through the process of uranium fission until it finally, seemingly inexorably, even after the removal of the introduced neutron source, continued to increase so that its strength doubled in 15 seconds. The observation of this effect, of this experimental proof of the independently running chain reaction, was for many the most beautiful reward for their exceptional efforts during construction of the reactor. It was the first type WWR-S nuclear technology large-scale installation delivered to the GDR by the USSR. We owe the development of nuclear physics in our republic to the generous support of the USSR which extends all the way to the education and continued training of specialists. Today there exists close bilateral, and in CEMA multilateral, scientific cooperation in nuclear physics. Results of nuclear research have penetrated our life.

[SPECTRUM]: The start-up of the Rossendorf research reactor furnished the prerequisites for many scientific activities. Would you name a few?

Professor Flach: It was a question of reactor physics experiments. The first attempts at noise analysis and examination of the neutron spectrum were also part of it, as was the construction of a local pile oscillator in the thermal column. Among other things, for example, our economy was waiting for materials testing with the aid of neutron irradiation and for radioactive isotopes. On 6 November 1958, the first shipment of such radioactive isotopes left the Rossendorf production laboratory. From that period special mention should be made of the first application of impulse activation in a reactor. With it, it was possible to make unstable nuclei with half-life values in the microsecond range--the starting point for a successful area of study.

The area of neutron diffraction also developed quickly. Beginning in 1958, we carried out related work jointly with what was then the Dresden Technical University.

We achieved interesting results through observation of the effects of radiation on solids. It was thus possible to achieve doping effects on CdS [cadmium sulfide] crystals after irradiation with thermal neutrons and to detect resultant nuclear transformations. These were the first experiments in neutron doping of semiconductor materials. In 1978, we resumed this work and developed a process for silicon doping. In 1980, the research collective received the national prize for this.

[SPECTRUM]: Certainly this development of nuclear physics radiates into other disciplines?

Professor Flach: Yes, indeed, because nuclear physics delivers the physical laws according to which everything operates which has any connection with applications. In this respect it is the mother of all applied areas. For example, nuclear measurement techniques are fundamentally based on effects of nuclear physics. This is true especially for applications. The production of energy is the greatest single area of application. The second--and not merely from the economic standpoint--concerns everything which is linked to the practical use of radioactive isotopes, with isotope production. Whereas during the first years of reactor physics experiments work on isotope production and the education of nuclear technology specialists took precedence, nowadays the reactor is used primarily for industrial production of radioactive isotopes as well as for basic research in solid-state physics. A prerequisite for the future use of this unique facility is its remodeling which is to be carried out in the next few years. In the process we are installing new instruments in the reactor with which its safety will be further increased.

[SPECTRUM] What social relevance, what impact does your institute have today?

Professor Flach: Certainly this question has to be answered in the light of 30 years. The institute, I believe, has by and large brought extensive influence to bear on social practice in the GDR. I have already cited examples. In what major areas is this happening today? Allow me first to

describe our attitude at that time. Through activity on this "front line" of science and technology we sensed that a "scientific-technological revolution" was in the offing. And through work on the high-tech field of "nuclear physics" we had an immediate influence on the GDR's scientific level. We were very soon able to delegate colleagues to other institutions because it was only a short time before construction of the first nuclear power plant in the GDR--at that time it was still called "an experimental nuclear power plant"--was taken on. Colleagues from Rossendorf, who had become familiar with the technology at the research reactor, went to Rheinsberg. One example is Prof Gerhard Ackermann, current rector of the Zittau School of Engineering. He was the first chief engineer for the reactor at our institute and then for years in charge of the Rheinsberg nuclear power plant.

A second area I would like to mention is the stimulating effect which the construction of nuclear electronic devices had on the development of scientific construction of equipment in general. To carry out nuclear research at that time, it was always necessary to use high technology devices. However, they were not yet commercially available. Therefore demanding methods in measurement technology and signal processing had to be used; nuclear electronic equipment construction developed. That is still felt to this day. What we are doing for the automation of scientific experiments is the result of this specialized scientific construction of equipment.

[SPECTRUM] Is it true, as we have heard, that the Institute for Nuclear Research did pioneering work with its computer assisted experiments?

Professor Flach: Such an assessment naturally pleases us. Perhaps an example is also in order here: The primary factor in intensification--we fully realize--is and has always been the full utilization of human potential. But that is only one side. The other is unquestionably linked to the use of capabilities such as is afforded us by the computer in research and in processes supporting research. Therefore we have--essentially based on systems industrially produced in the GDR and in agreement with the producers and developers--created a new automation system for our research reactor which, is, of course, terminal-oriented and enables the operator to make appropriate decisions for special situations. It is described as a hierarchical informational system. If, for example, the reactor operator wants to find out: What is the current power distribution in the active zone?--using specific programs, he can have this information displayed on the screen, supported by numbers, and color-coded. This will lead to a new stage of process optimization. As a further example, I would like to cite the work on computer assisted experiment automation on accelerators. Here the experimenter is given the capability to work interactively with the evaluation computers as well as with the conduct of the experiment. He can make decisions on this basis. This type of process automation is also applicable to other large, complex technological systems, e.g., in power plants.

[SPECTRUM] Is the Central Institute for Nuclear Research something like an "isotope factory"?

Professor Flach: Of course, this description does not fit an academic research facility. However, our isotope production for many areas of

medicine, of the biosciences, of transportation and communication as well as of electrotechnology/electronics is an important emphasis in the work of our institute. After all, the GDR is the second largest producer of radioactive products within the socialist countries. We began with the generation of such isotopes right away in 1958, after start-up of the reactor and the cyclotron. The cyclotron was initially developed as a principal experimental device for nuclear physicists. With it they contributed to the clarification of reaction mechanisms in light nuclei and conducted theoretical examinations on the excitation states of deformed nuclei resulting from the decay of long-lived isotopes--to mention only two examples. With the shifting of the front line in nuclear physics to increasingly higher energy levels and with that to larger accelerators, basic research in nuclear physics became increasingly oriented to the use of the large accelerator in Dubna. The cyclotron began to be used more for applied areas. Now, and also in the future, our reactor is the primary instrument for generation of radioactive isotopes.

[SPECTRUM] The 10th plenum of the central committee of our party stressed an even closer integration of science and production. The key technologies play a large roll in that. What contribution is the Central Institute for Nuclear Research making to that?

Professor Flach: We can point to many close connections lasting for years with cooperative partners in industry. I would, however,like to emphasize our basic research in microelectronics. For example, in our reactor silicon is irradiated with neutrons. In this process we must take care that the neutron flow is distributed as evenly as possible over the diameter of the crystal and its total area. Thus, based on the nuclear reaction triggered by the neutrons, a phosphorus doping is formed homogeneously distributed over the silicon. This doping generates certain desired conductive properties in the silicon.

A conventional process runs as follows: The grown monocrystal is sliced into sheets, and then phosphorus is added to it in special facilities via diffusion processes. It is, however, economically and technologically more advantageous to dope the monocrystal in the reactor from the outset. The silicon prepared in this way goes directly to the components industry as a basic material for high speed transistors. We are pursuing these work areas jointly with the trace metals VEB in Freiberg. The company, which grows the silicon crystals, is our client and also finances to a large extent the pure research for the further development of this area. In microelectronics we are pursuing still another significant area. I refer to the use of nuclear irradiation for analytical purposes. It is important for the examination of very small structures. Such qualitative analyses are ultimately aimed at improving the reproducibility of such technologies because their yield depends on it. These are two examples of many which might be cited for the application of nuclear physics which were not yet present at its birth. We have always placed great value on close cooperation with our industrial partners. It is clear, the 10th plenum clearly demonstrated this to us again, that the level of integration among basic research, applied research, and industrial combines and production must increase. To that end, we have in recent weeks once more analysed in detail this aspect of our work, and we are currently ready to resolve through contracts with our partners the problems rising out of the new

requirements--I mention here only the combines for nuclear power plants, power plant equipment construction, microelectronics, and robotics.

[SPECTRUM] So far, throughout the history of mankind it has always been true that with the depletion of one energy source the next one has been on tap, so to speak. If--as surveys imply--our coal is only sufficient for approximately another 50 to 60 years, is nuclear energy advanced enough that it can take over the supplying of energy?

Professor Flach: It is true that the history of the energy industry is a history of substitutions. Naturally it must be taken into consideration that in recent decades, because of marked growth in energy consumption, availability problems for certain energy sources and also political factors have taken on increased influence. Today's continued widespread use of coal energy with the burning processes for generation of heat, steam, and electrical energy is actually, as I see it, characteristic of the energy industry of the second stage of the industrial revolution. The epoch of socialism will certainly be accompanied by an energy industry based on atomic energy (nuclear fission and nuclear fusion), which will replace the direct burning of coal. Coal will still be used for the processing of refined energy sources, especially those which are still supported by gas and petroleum.

I want to refer to a second aspect which is characteristic of the development of the energy industry--the economics of energy. It has a completely different status from what it had in the previous phases.

Nowadays the level of development of nuclear energy and its installations has progressed to the point that it could assume an extensive share of energy production, right now, immediately. We should also consider the fact that nuclear energy presents a technology which is not harmful to the environment and that the issues of the safety of nuclear power plants are taken very seriously. We are looking internationally at 4,000 reactor operation years, and compared with the petroleum industry and mining, nuclear power plants are much safer than conventional production facilities.

But we also know that such substitution processes are very investment intensive and require large shares of the reproduction funds. Therefore they can only be achieved over long periods of time. A very significant task for science and technology in this area consists precisely in accelerating these processes.

[Box, p 11]

About the Man

Prof and Dr of Engineering Guenter Flach, born in 1932, studied mathematics and physics at Rostock. In 1953 he was delegated for study at Leningrad University. There he came under the influence of the Leningrad school of mathematical and theoretical physics through Smirnov and Fock. He specialized in theoretical nuclear physics. In 1958 Professor Flach began his activity in the Central Institute for Nuclear Research, in a large collective of young, enthusiastic scientists of almost all the same age and a few experienced

scientists, such as Professors Fuchs, Schwabe, and Schintlmeister. In this atmosphere he devoted himself to application of group theory methods to nuclear theory. In 1965 he crossed over into the developing major field of emphasis of nuclear energy technology. Since 1972, Professor Flach has been director of this institute. He has been involved with conceptual and strategic issues of energy technology, especially of nuclear energy technology, and is participating in the development of interdisciplinary work among natural scientists, technological scientists, and social scientists in this area. Professor Flach is currently a member of the Central Energy Commission of the GDR as our academic representative and a member of the presidium of URANIA.

[Box, p 13]

About the Institute

The Central Institute for Nuclear Research at Rossendorf near Dresden was established on the basis of a decree from the council of ministers concerning the peaceful use of atomic energy in the GDR on 1 January 1956. Its rapid development resulted from the support of the Soviet Union: in 1957/58, the start-up of the first GDR research reactor of the WWR WWR-S type and of a high-frequency U-120 cyclotron. In 1962, it developed its own ring-zone reactor. In 1972, the Soviet linear accelerator EGP-10-1 was constructed. These major pieces of equipment still constitute fundamental components of the experimental base of the institute. The scientific profile is shaped by three major areas: Basic research in nuclear physics, application of nuclear methodology to solid state physics, and advanced research for isotope production and in energy technology; these areas currently utilize more than 40 percent of the research capacity. The spectrum of their scientific and scientific-technical assignments ranges from the solution of fundamental problems of physics all the way to manufacturing.

PHOTO CAPTIONS

1. p 10 — Loading of a high-speed sterilizer into a hot cell

2. p 11 — Corresponding academic member Guenter Flach as a guest in the editorial offices of SPECTRUM

3. p 12 — Measurement station for examination of thin transparent layers

4. p 13 — Part of the Central Institute for Nuclear Research in Rossendorf

5. p 13 — View of the main hall of the U-120 cyclotron

6. p 13 — The active zone of the RAKE II zero-energy reactor

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HUNGARIAN ACADEMY OF SCIENCES PRESIDENT ON PLANS, PRINCIPLES

Budapest MAGYAR TUDOMANY in Hungarian No 3, Mar 86 pp 213-219

[Interview with Academician Ivan T. Berend: "Principles and Plans"; date, place, and occasion not given]

[Text] MAGYAR TUDOMANY: As the incoming president of the Academy, elected at its latest general assembly, what do you regard as your most important tasks?

Ivan T. Berend: Naturally, the election of new officials does not mean the start of a new era in the life of a 160-year-old institution. The main duty of the officials holding office at any given time is to faithfully observe the venerable traditions of the Hungarian Academy of Sciences, to strive to follow the example of their tradition-establishing great predecessors, and to do all this under the conditions of their own term of office; in other words, pursuant to the new requirements. The 1984 and 1985 general assemblies have comprehensively formulated these requirements. Accordingly--let me begin with what has caused so much concern also for the outgoing Presidium--we must make every effort to improve the conditions for basic research (it had to be relegated into the background during the past decade) so that we may better fulfill the Academy's principal mission. From May through October of last year, with the government's full support, we have indeed been able to create more favorable conditions for the coming years in the new five-year plan, through larger allotments for scientific research, including the National Scientific Research Plan and the 3.8 to 4.0 billion forints earmarked for it. (Here I wish to note that we cannot be complacent about these conditions; instead, we must seek further opportunities, perhaps through novel ways of cooperating with large enterprises and also through the better utilization of our international relations.)

However, the substantially larger amounts intended for basic research must not be distributed in an egalitarian manner. We must find at last a mode of distribution which concentrates on the most important objectives (scientific fields and topics) and rewards the best talent and greatest diligence; i.e., nonegalitarian distribution. Perfunctory, egalitarian distribution that attempts to satisfy every demand, by scientific disciplines or on some other basis, would be a big mistake. To manage the National Scientific Research Fund is an enormous new responsibility, an unprecedented task for the Hungarian Academy of Sciences. The government has assigned the Academy responsibility for coordinating not only the basic research at the Academy's own research

centers but all other basic research in Hungary as well. The Academy's collegiums--its scientific committees and departments--must work out the principles of distribution, the methods of evaluation and grading, and the proposal on judging the submitted competing applications. In conjuction with the activities of the scientific collegiums, the administrative workload of the Academy's special administration will increase considerably; and the decision that the secretary general makes [regarding the distribution of resources for research], with the support of interdepartmental coordination, will have to take every aspect into consideration. Thus the Academy will be able to discharge this exceptionally important science-policy task only if its scientific collegiums and special administration function in complete harmony and unity.

M.T.: In your interpretation, what does the Academy's unity mean? Perhaps a revision of the Academy's 1970 reform, some sort of reorganization of the Academy?

I.T.B.: I dislike reorganizations. Although reorganizations may be unavoidable in some instances, often they are stopgap measures that merely avoid real actions, but absorb much time and energy. (Bruno F. Straub once said half-seriously that anyone who reorganizes ought to be given a suspended prison sentence that would be reviewed five years later. If the reorganization proves useful, the reorganizer could be acquitted; otherwise he would have to serve his sentence.) I have never been an ardent supporter of the 1970 reform, but it does not mean at all that I regard as ideal the previous conditions, under which exclusively the scientific collegiums were running the Academy. It is indisputable that our Academy's organizational strucutre is unique in the world. There is nothing similar, east or west of us, with separate collegial and administrative parts within the same academy. But it is likewise true that many different structural solutions are possible, and none of them can be regarded as exclusive. The academy in Finland or Cuba has no scientific collegiums and is actually a state science council, the highest government agency in charge of science. The scientific societies (academies) in France, England, the Federal Republic of Germany or the United States are essentially voluntary organizations, not linked in any way with the variously named state institutions that direct science. There are countries--Austria, for example--where science and higher education are under one ministry. The Soviet Academy of Sciences is run strictly by its scientific collegiums; its special administration, under the secretary general, merely carries out the collegiums' decisions. In the German Democratic Republic and Poland, the activities of the scientific collegiums and special administration are separate within the academies; but one-man management by the president (in the GDR), respectively by the secretary general (in Poland), ensures the necessary linkage between the two spheres. The traditions of the given country always play a role in each solution. Obviously, the management of science can be solved within any structure, and we must reckon with the fact that every solution has both advantages and drawbacks. As an important advantage stemming from the 1970 reform I regard the fact that the Academy is not a ministry of science, not a national science council or similar agency of public administration, and officials of its scientific collegiums are not government employees. This ensures conditions far more favorable for democracy in the life of the Academy's scientific collegiums, for the independence of scientific research, and for the relationship between science and politics. It would be a grave mistake to relinquish

this advantage. From this point of view, then, I personally would not be in favor of one-man management within the Academy.

On the other hand, the present organizational structure has an indisputable drawback in that the scientific collegiums' substantive science-managing work, which involves the adoption of professional standpoints and statements of opinion, is excessively separate from the special administration's operational decision-making activity. Suitable feedback from this latter sphere to the scientific collegiums is lacking. This could undermine the soundness of the decisions and demoralizes the scientific collegiums' work.

In my opinion, nevertheless, restoration of the scientific collegiums' pre-1970 operational decision-making and managing role would not be the solution. This would place an unnecessary burden on the scientific collegiums and in part would not be feasible. Then how could we preserve the aforementioned advantage stemming from the 1970 reform, and at the same time eliminate the unfavorable effects of the excessively rigid division?

I see the solution in ensuring a closer and more systematic link between the Academy's scientific collegiums and its special administration, while preserving their separation. It will be expedient to leave the tasks of administering the Academy's network of institutions (on the basis of the sciencitif collegiums' standpoints and proposals) to the present separate special administration under the secretary general's one-man responsibility. But in the sphere of the Academy's nationwide responsibility for basic research, pursuant to the 19 December 1985 resolution of the Council of Ministers, the most important tasks in conjunction with preparing the distribution of the National Scientific Research Fund, and with the substantive direction of science and evaluation of the work performed, take place in the scientific collegiums; therefore also the decision must be fed back to them directly. Here the Academy's collegial and administrative spheres have to be linked systematically, while the government's usual options to set and assert preferences, and to this end the secetary general's one-man decision-making authority over the disbursement of budgetary resources, are also retained. This is why we proposed that the secretary general, in addition to his responsibility to the government, be made responsible also to the Academy's collegiums, primarily to its general assembly, respectively to the Presidium between general assemblies. The Council of Ministers accepted our standpoint when it ordered that the secretary general "shall report on his work to the general assembly and the Presidium . . . and shall implement their decisions pertaining to the national direction of basic research and research in the social sciences." This suitably ensures the Academy's previously mentioned unity in its task of directing national basic research, the real decision-making authority of collegial work, and the scientific collegiums' suitable support for special administrative work. This way, I believe, we have been able to eliminate the earlier main weakness of the Academy's organizational structure. Science cannot be managed solely by decisions based on one-man responsibility (although such responsibility is sorely needed for the final decisions). The collective wisdom that resides in each scientific field's collegium is indispensable. Especially in areas of research outside the Academy, this collective wisdom can provide a reassuring underpinning for the final one-man decision and enhances the authority of such decisions. Thus it supports, rather than limits, the secretary general's work.

The Academy's secretary general shared this view, and we presented our proposal jointly in the debates during its elaboration, and before the Council of Ministers.

Now that the government, at its mentioned session last December, accepted our standpoint and institutionalized the linking of collegial work and special administrative work (by amending Law Decree No 6 of 1979), the collegiums are better able to exercise their authority to request reports. This authority is laid down also in the Academy's by-laws; but it must be admitted that, for a long time, the scientific collegiums have hardly exercised this right. Thus if the secretary general is responsible also to the general assembly and Presidium for the national coordination and management of basic research, if he implements their standpoints and also reports regularly to the collegial forums, then I feel that the Academy's indispensable unity will be ensured, without any reorganization and also without having to relinquish the advantages that the present organizational structure offers.

M.T.: In the course of our preceding question, we have departed from our initial topic. Namely, in listing your most important tasks, we have covered only the first point. What other principles do you intend to abide by in your work as president?

I.T.B.: Through its collegiums, committees and institutes, the Academy has achieved a special concentration of brainpower. The ways in which we utilize this concentration of brainpower range from research at our own institutes, to the scientific collegiums' participation in preparing, and commenting on, important government decisions. The work in preceding decades has won great social recognition and prestige for the Academy. This is an enormous intellectual and moral capital that must be put to use in the interest of scientific progress and our country's development. Much better than up to now in more than one area, I might add. We must strive for a more forceful impact of the Academy's intellectual resources. In part I have already submitted proposals to this effect to the Presidium, and in part they will be included in the Presidium's agenda for the coming months, respectively in various practical activities.

Allow me to list some of these proposals, without any claim to their complete coverage. As in the past, we would like to devote special attention to important national issues, and to participate in the preliminary debate and commenting procedure on the government decisions aimed at solving these issues. For years the Presidium has been doing this work very skillfully, with the help of its appointed preparatory committees and, occasionally, of our institutes. We would like to continue this work and even develop it further, in a way such that the Presidium would not only investigate issues of public interest when commissioned by the government to do so, but would itself initiate the investigation of topics it regards as important and would submit proposals on them. (This spring, for example, we are investigating the nationwide state and regulation of the publishing of scientific books and periodicals, and are submitting reorganization proposals to the government.) It likewise seems expedient that the Presidium follow up from time to time the proposals on which it had expressed its opinion earlier, and which then served as the basis of subsequent government decisions, so as to generate feedback on what has actually been

accomplished, how effectively, and with what mistakes. Not only are the lessons of such follow-ups important, but the feedback method also strengthens democracy in the preparation of the decisions.

Another of our decisions intended to strengthen the Academy's intellectual influence calls for including scientific questions of public interest, or national social issues, in the programs of the central lectures and meetings for the presentation of papers that are scheduled every quarter. We are thereby creating important scientific and public forums--in addition to the keynote lectures and scientific debates at the general assembly, instituted nearly 15 years ago and followed with keen nationwide interest. Within the framework of these central lectures and meetings for the presentation of papers, for example, we are planning to debate this year the ideal of modern culture, the relationship between industry's competitiveness and its domestic intellectual base, and the questions of the peculiarities and distortions in our system of remuneration. And, in accordance with the task assigned the Academy since its foundation, we are also planning to examine the situation with regard to the culture of our language.

Approaching this same question from another aspect, I believe that our scientific collegiums ought to show more initiative and assume a greater role also in the area of scientific qualifications. Pursuant to a recent resolution of the Academy's Presidium, therefore, the scientific committees and departments--instead of playing merely a passive reporting role in evaluating the individual applications submitted to the Scientific Qualifications Commission--will periodically review their respective fields and will avail themselves of their already existing, but rarely exercised, right to propose on their own initiative to the chairman of the Scientific Qualifications Commission that the researchers deemed suitable be invited to submit their doctoral (or, exceptionally, science-candidate) dissertations. The Academy must strive also in this manner to reinforce professional standards and the scale of values.

But we must not forget the questions of forming public opinion regarding science, and of popularizing science, either. The Academy cannot remain indifferent to what is happening in this field in Hungary. Instead, the Acedemy must strive to achieve that the most important research results, and the proper way of viewing them, reach the widest possible masses; it must help to dispel the pseudoscientific beliefs and irrational myths that arise from time to time; to shape public opinion regarding new discoveries; and to aid, guide and inform workers of the mass media assigned to this field. To this end we intend to make regular the briefings for the news media on the work being done at our institutes, on the scientific collegiums' assessment of the situation in the individual sciences, and on the more significant new scientific results. The Presidium will be discussing this question this spring.

In my listing of examples, I have left the most important one for last: namely, development of a close, organic link between research and education, which appears to be of paramount importance from the viewpoint of society's using the Academy's brainpower more efficiently. This simultaneously means more effective support of public education, and also direct participation in higher education. In the interest of the former, the Presidium has revived its Committee on Public Education, under Academician Janos Szentagothai (he had been

its chairman also in the early 1970's). In its time, this committee made important contributions by elaborating the ideal of modern culture, and new syllabi. Now it will carve for itself a scope of action that is feasible under the present conditions in public education. This will cover a very wide range of tasks and opportunities, from work on textbooks and reference works, to postgraduate training for teachers.

Direct participation in higher education is a task that has long been on the agenda and has been formulated repeatedly, but up to now every attempt to implement it has failed. Yet it is an incredible luxury to maintain two parallel systems of research, respectively higher education and research, institutions in the country, leading to a dissipation of manpower and resources. This is harmful to both research and higher education. In view of our considerable scientific potential, it is a depressing fact that--not counting the not negligible voluntary work in higher education--merely 10 percent of the Academy's researchers are teaching in higher education (holding part-time jobs at universities, or as lecturers paid by the hour). Learning from past failures, we will not attempt to accomplish by means of reorganizations the linking of research and of instruction in higher education. The present system of institutions would remain intact; but the Academy's research institutes, and the university departments and institutes would be organically linked to operate the institutions. We will strive to achieve this not through a frontal attack and from one year to the next, but gradually and in accordance with the specific conditions. Where the conditions are favorable, the linking can already begin, as it has with the establishment of the Physics Center in Debrecen, on the initiative of Academicians Berenyi and Csikai. Under this system, the Academy's research institutes would plan their own curricula, geared to the curricula of the universities. The institutes' curricula would dovetail with university instruction by offering alternate mandatory courses, elective special courses, and guidance for graduating students writing their diploma dissertations and for doctoral students on scholarships. At the same time, the university departments and institutes would be able to introduce the system of granting a sabbatical year for research at Academy institutes, with access to the Academy institutes' technical equipment (during as well as between sabbaticals). It is likewise in the common interest that such combinations of institutes would contribute to the more efficient use of material resources also through the coordinated expansion of the stocks of instruments and library acquisitions.

The Presidium has already approved in principle a proposal to this effect and has appointed a committee, under Academician Tibor Vamos, to draft detailed proposals by summer, in cooperation with the Ministries of Culture and Education, Agriculture and Food, and Health.

M.T.: Even this listing of examples indicates extremely wide-ranging plans and tasks. Are the scientific collegiums and special administration of the Hungarian Academy of Sciences ready and able to handle them?

I.T.B.: This question cannot be answered unambiguously in the affirmative or negative. The more than 200 members functioning in the Academy's ten departments, the much larger mass of researchers, university instructors and practical experts on the departments' committees for the individual sciences and the

combined committees, and the Academy's proven and experienced special administration will be capable of exceptionally great tasks also in the future, just as they have been in the past. And we must not forget, of course, the approximately 10,000 staff members in the Academy's network of institutes; it logically follows that they, too, can be included in the outlined work.

It is already obvious that both areas have to be reinforced. In some fields, for example, our scientific collegiums have been weakened. The consequences of rejuvenation, advocated so dramatically a few years ago by our fellow member, the late Sandor Szalai, have not made themselves felt. It appears that it is not enough to emphasize the importance of rejuvenating the Academy; we must also seek some kind of institutional guaranty for it. In the French Academy, which is particularly senescent because the seats in it become vacant only with a member's death, the rule has been adopted that half of the newly elected members must be under 55. The by-laws of the Bulgarian Academy specify that a person over 60 may be elected a corresponding member only with the Presidium's approval. Our 1985 general assembly called for a revision of the Academy's by-laws and rules of procedure, and for submitting the drafts to the next general assembly in May 1986. This, I think, is a good opportunity, to establish some kind of institutional guaranty.

Naturally, we are seeking also other reinforcements for the national coordination and financing of basic research, the newly assigned task of the Hungarian Academy of Sciences. This applies to both collegial and administrative work. To finance the thorough professional judging and suitable administration of the incredible mass of applications in the competition for research grants, we have set aside for this purpose a minimal share of the allotment. (This is the solution we used also in 1984, when 200 million forints was made available for grants to support basic research.)

In other words, we have to bear in mind not only the present personnel of the scientific collegiums and special administration, but also their reinforcement and ad hoc expansion. All our opportunities for this are ensured, and we only have to avail ourselves of them.

However, it is obvious that the tasks in question are enormous, requiring the improvement of both our collegial and our administrative work. There is the danger of difficulties arising in the implementation of the new tasks, and of mistakes due to inexperience, especially in the beginning. Misinterpreted local and group interests might assert themselves. In more than one field, for example, incomprehension and indifference bred by habit might raise obstacles to the linking of research and teaching. In the final outcome, the greatest sources of mistakes in every area of our work are inattention, complacent indifference, rigid adherence to the accustomed, the everyday consequences of inertia, and--in combination with all this, of course--failure to provide suitable incentives. We would be naive to assume that we no longer have to reckon with all this. But we can find a remedy for it, through more efficient work organization, by taking the interests into consideration, and by finding and providing incentives.

M.T.: By incentives, do you mean also financial incentives?

I.T.B.: Of course. Although moral and financial incentives are not the same thing and it would be a mistake to equate them, in a sound society they cannot be divorced permanently from each other. Today, more than ever before, economic and social progress depends on highly skilled labor and the work of vocational intellectuals. Our wage system does not take this into account. The new system of financing science, in our own country, provides an opportunity to reward truly successful research far more, in a manner really differentiated according to performance. This, too, is a step in the right direction.

Even at present, however, our possibilities in the areas of wage and manpower management are more extensive than what we avail ourselves of. In very many of our institutions (and this can be said of higher education as well) we are indeed stuck with staff members who are not the most suitable for doing research independently but are perhaps eminently suitable for work in other areas. Their proportion could be approximated only by estimates, but everyone has personal experience of this sort. A more critical and demanding personnel policy (and even today there are examples of this in one or another of our outstanding institutes) could in itself make salary increases of 10 to 12 percent or even more possible.

Abandoning egalitarianism, at the institutions that efficiently combine research and teaching we could provide more incentive through the more concentrated spending and--in cooperation with the ministries--reallocation of resources.

Finally, in the interest of rewarding performances, we must find a solution to the meaningfully better financial recognition of the highly qualified research-and-teaching staff. As you very well know, the amounts of the salary supplements for scientists were determined in 1951, and inflation since then has reduced their real value to a fraction of what it was originally. Since salaries in research and higher education have lagged behind the average wage increases anyhow, and it is justifiable to speak of the depreciation of intellectual work, we cannot regard this process as anything other than highly qualified labor's lack of recognition. Its practical consequences are extremely harmful. They destroy the appeal of scientific careers, and hence also the opprtunities for good selection. They force our researchers in their most productive years to undertake extra work, often in activities far removed from their professions, merely to support themselves properly and to acquire an apartment. I do not know whether we have any real Michelangelos, but perhaps this cannot be determined because they all are too busy carving chair legs [reference to Madach's "Tragedy of Man"].

I personally am opposed to privileges and, moreover, regard as excessive the hierarchy of our system of scientific degrees. But even if the necessary raises for intellectuals (and highly skilled blue-collar workers), in combination with a radical transformation of the wage differentials, could halt the processes that have long been heading in the opposite direction, the time this took would, regrettably, be too long. Therefore we must strive for the possible financial independence of the vanguard of our scientific life who have been recognized as such also by awarding them scientific degrees. I consider this a step of great practical and political importance. The Academy's general assemblies have repeatedly formulated this requirement. I regard its assertion

in some form or other as a part of the Academy's duty to safeguard the interests of scientists. Last autumn the chairman of the Scientific Qualifications Commission and I submitted a joint proposal to the Science Policy Committee, and I have been participating for months in talks to resolve this question.

M.T.: A personal question. Do you have time for research and to continue your earlier professional activity?

I.T.B.: Very little, at present. In the first months, I did not even attempt to find any time for research. Although I have been on committees of the Presidium since 1974, and have attended meetings of the Presidium as chairman of the No II Department [of Economic and Legal Sciences] since 1979, I have had to familiarize myself with very many new areas and have become suddenly involved also in the work on transforming the management of science. In spite of this, I continue to teach at the university while "on leave without pay." I hold my lectures and direct the department's textbook-writing efforts. Since my election, I have written three studies, one each for a lecture at home or abroad. One of the studies is a contribution to a comparative analysis of the depression of the 1930's and the 1970-1980 recession, a volume that is being published by the section which I organized at the 1986 International Economic History Congress, in Bern.

Most of the spare time I could find has been devoted to putting the finishing touches on three volumes and to readying them for publication. It so happened that last summer I was finally ready with the manuscript for the third, considerably revised and expanded (by about a third in volume), edition of my "Valsagos Evtizedek" [Decades of Crises], which first appeared in 1982. However, work on the layout and illustrations was ready only by the end of the year. Preparing the English edition of this work for publication was likewise no mean task, the more so because the translation was based on the manuscript of an earlier edition, and I had to enter in the English text the structural changes and additions that had been made. Finally, Gyorgy Ranki and I completed by summer our economic history of Europe in the 19th century, and readying the manuscript--it numbered 1100 pages--for publication was yet another task.

I will not begin any major undertaking before the second half of this year. Being a very early riser, I intend to work regularly until the late morning hours each day. I hope to solve this way, although at a slower pace, the editing and partially the writing of the four-volume synthesis of Hungary's economic history that my former university department is planning to publish.

Thus I will be able to truly assess only in the future the real constraints on my professional opportunities. One thing is certain: I would like to continue my research and teaching. In the coming years, however, the Academy duties stemming from my election as president, which I regard as a great honor, will receive top priority.

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

INVESTMENTS OF INSTITUTIONS UNDER HUNGARIAN ACADEMY OF SCIENCES

Budapest AKADEMIAI KOZLONY in Hungarian 19 Mar 86 pp 38-39

[Text] Instruction No 2/1986 (A.K.2) MTA-F.sz. of the Secretary General of the Hungarian Academy of Sciences Concerning the Regulation of Investment Activities by Budgetary Institutions Under the Supervision of the Hungarian Academy of Sciences.

In connection with Decree No 46/1984 (XI.6) MT (in the following: Decree) and the jont Decree No 3/1984 (XI.6) issued for its implementation, and in agreement with the chairman of the National Planning Office, the minister of finance, with respect to the subsidized research institutes with the minister of health, as well as with the minister of agriculture and food and culture and education, I issue the following instruction:

Paragraph 1. The Scope of the Instruction

(1) The scope of this instruction embraces, within the purview of other central investments regulated by Article 3 Paragraph (2) c) of the decree, investment activities performed by the Central Office of the Hungarian Academy of Sciences (in the following: Academy) and the research centers, research institutes, research groups, research laboratories, servicing agencies and other budgetary institutions (in the following: investors) under its supervision, regardless of the source of the investment.

(2) With respect to the universitary and other research facilities, which are supported by the Academy but are under the supervision of another ministry (or agency of national authority), the scope of authority of this instruction comprises only those investment activities which are charged to funds used generally for academic purposes.

Paragraph 2. Preparation of the Investments

(1) In case of investments related to construction:

a) When the stimated cost exceeds 50 million forints, the investor has to prepare, in terms of the Decree, an investment program, which is described in Annex No 1, and has to submit it for approval;

b) when the estimated cost exceeds 10 million forints, and in the case of reconstruction plans the cost of which exceeds 20 million forints, the investor--after approval of his investment plan--has to prepare a detailed study plan, which is described in Annex No 1, and has to sumit it for approval;

c) in case of cost estimates under 10 million forints and for reconstruction costs under 20 million forints, the investor has to prepare a simplified study plan, described in Annex No 2, and has to submit it for approval.

(2) In case of investments in machinery and instruments:

a) for the purchase of machinery, instruments and computers, unrelated to construction, the investor has to prepare a program showing the investment task and including a detailed list of the instruments, the cost of which exceeds 150,000 forints and has to submit it for approval;

b) the program to be submitted has to carry enclosures containing the motivation for the purchase of certain instruments, in terms of Annex No 3, when the cost exceeds 1 million forints and in terms of Annex No 4, when it surpasses 5 million forints.

(3) In case of business management investments, the prescriptions concerning the documentation required for the preparation and approval of the investment are regulated by the competent authority, in each case individually.

Paragraph 3 Decisionmaking Jurisdiction

(1) The secretary general of the Hungarian Academy of Sciences exercises jurisdiction in the area of academic institutions over investments which are debited fully or partly to funds provided by the Academy.

(2) The head of the investing agency exercises jurisdiction over investments which are debited to its institution's own funds, or to account No 36 of its budget.

(3) The decisionmaking authority exercises jurisdiction over the implementation of the investment; it licences it by the issuance of a concession document.

Paragraph 4 Miscellaneous Provisions

(1) In case of investment planned (or to be implemented) jointly with non-academic agencies, the proceedings must follow the agreement.

(2) When a joint investment affects also funds provided by the Academy, the investor cannot make the corresponding agreement without the previous consent of the Academy.

(3) Once an investment program is approved, the investor cannot depart from it, except for the purchase of instruments, the estimated individual price of which runs below 1 million forints, lest he violates the goal set.

Paragraph 5 Concluding Provisions

(1) This instruction enters into force on the date of its publication, and concurrently instruction No 1/1979 (A.K.1) MTA-F will loose its validity.

(2) The Finance Department of the Academy will issue guidance concerning such procedural matters which are not regulated in this instruction, and the interested parties will receive this guidance directly.

(3) The procedural matters relating to the exercise of decisionmaking authority will be worked out in the organization and functional statutes of the Academy and the institutions.

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EAST EUROPE/ SCIENTIFIC AND INDUSTRIAL POLICY

ROLE, MAKE-UP OF HUNGARIAN SCIENCE POLICY COMMITTEE

Budapest AKADEMIAI KOZLONY in Hungarian 19 Mar 86 p 38

[Text] Resolution No 1070/1985 (XII.28) of the Council of Ministers, Which Amends Resolution No 1016 (1978.VI.10) of the Council of Ministers Concerning the Role, Jurisdiction and Functions of the Science Policy Committee.

1. Articles 1) and 2) of Resolution No 1016 (1978.VI.10) of the Council of Ministers concerning the role, jurisdiction and functions of the Science Policy committee (in the following: Resolution) is replaced by the following provisions:

"2. The Committee performs the task of proposals and initiatives, within the purview of the goals designed by the Council of Ministers, in the shaping of our science policy. It has a directing role of principle in the implementation of the science policy, promotes the coordination of the state management of scientific research and technological development, and strengthens the connection between research development and practice. The Committee intervenes in the coordination of our policy of science and technological development with our social and economic policy."

2. Article 11.3A of the Resolution is replaced by the following provision: (The Committee will discuss and comment it prior to its submission to the Council of Ministers):

"a) the motions that involve social and economic policy issues, which are important from the point of view of our policy of science and technological development."

3. Article 11.4.i of the Resolution is replaced by the following provision, and Article 11.4 is completed by a new m) alinea:

(The Committee proceeding within its sphere of authority):

"i) gives its preliminary consent to the foundation of research institutes."

"m) The Committee may establish permanent and provisional working commissions for the sake of making proposals and giving advice."

4. Article 11.5 of the Resolution is replaced by the following provision:

"5) The Committee, in connection with other government committees:

- discusses and evaluates from a science policy viewpoint conceptions dealing with the general problems of social and economic development, that underlie the long, medium, and short term national economic plans as well as the research and development chapter of the medium-term national economic plan and plan proposal;

- surveys the implementation of the research and technological development plans, which have been established within the framework of our central development programs, and assesses the proposals concerning development programs from a science policy vantage point;

- promotes the coordination of the medium-term national economic plan with the research-development plans;

- takes a stand concerning the definition of the main trends and tasks of our international science-technological cooperation.

5. Article III.6 is replaced by the following provision:

"6) The chairman of the Committee is a deputy premier, appointed by the Council of Ministers.

Members of the Committee are:

- the minister of health
- the minister of industry
- the minister of agriculture and food
- the minister of culture and education
- the minister of finance
- the chairman of the National Planning Office
- the president of the Hungarian Academy of Sciences
- the secretary general of the Hungarian Academy of Sciences
- the chairman of the National Technological Development Committee."

6. This Resolution enters into force on the date of its promulgation; concurrently Article II.4, alineas j) and l) and Resolution No 1034/1984 (VII.8) of the Council of Ministers will become void.

Signed: Gyorgy Lazar
President of the Council of Ministers

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EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ROLE OF HUNGARIAN TECHNICAL DEVELOPMENT COMMITTEE EXPANDED

Budapest OTLET in Hungarian No 12, 20 Mar 86 pp 14-15

[Interview with Laszlo Mohacsi by Gabor Rejto: "Refined Development"]

[Text] The area of responsibility of the National Technical Development Council (OFMB) was modified as of January 1, 1986 by the Council of Ministers. According to the decision, the OMFB is the central state agency for technical development on the national level concerned with the direction of multi-discipline technical development and related research. We asked Dr. Laszlo Mohacsy, the director of the executive branch of the organization that now has control over 10 billion forints, about the reasons for the increase in jurisdiction of the OMFB, and about the opportunities and responsibilities of this organization during the period of the current Plan.

[Question] What do you see as the substance of the modification?

[Answer] The dominant role of the OMFB so far has been coordination, evaluation, and consulting. Since January of this year the emphasis has been on the direction of functional work. In the past, evaluation and coordination meant that we brought our views in agreement with those of the ministries and other high administration. Now, however, the OMFB or its president presents our opinion and ideas regarding technical development and research to the government. Of course, agreement with the ministries remains essential, but responsibility is now greater; after all, we now represent our own point of view, instead of merely coordinating.

[Question] Does this mean that decision making is enhanced at the cost of consultation?

[Answer] The jurisdiction for decisions of the OMFB has increased but the most visible change is that its role has grown significantly in the preparation of government decisions.

[Question] Do you have an opportunity to veto a top-level decision concerning technical devlopment or to impose your own concept single-handedly?

[Answer] Theoretically we can never veto, we don't have the right. The chances of obtaining a desired decision have improved dramatically, however. We must participate with more initiative and more responsibility in the modernization of the direction of the economy, the creation of economic controls, and in planning for the national economy.

[Question] In this context, can one talk about the OMFB's own interest and purpose as an institution?

[Answer] Absolutely. If I look at our situation from a functional point of view, I can say that the OMFB is now, much more than in the past, responsible for the technical development of the country, for the planning and implementation of technical development policy on the national level.

[Question] What means do you have for putting your ideas into effect?

[Answer] Both organizational and financial means are at our disposal. The president of the OMFB has a permanent seat at the meetings of the Council of Ministers, the Planning Committee, and the Science Policy Council. It can submit designs to these bodies, it can offer its opinion, it can oppose the submission of other organizations or whatever is being discussed. Along with other ministries, the OMFB receives, in a certain proportion, monies from the technical development pool.

[Question] Who decides about the apportioning of the funds?

[Answer] This is usually debated at length at the meetings of the Science Policy Council. The decisions made there are approved by the Council of Ministers.

[Question] How much money do you get in a year?

[Answer] About 2 billion forints.

[Question] Does this include the costs of running OMFB itself?

[Answer] No. The approximately 60 million forints for this purpose are obtained from the general expenditures fund.

[Question] Who participates in the meetings of the Science Policy Council?

[Answer] The representatives of the areas concerned, the president of the MTA, representatives of the National Planning Bureau and of the Treasury. The president of the committee is the deputy president of the Council of Ministers.

[Question] In what form do you use the sums at your disposal?

[Answer] In a decreasing measure as direct support, and increasingly with the obligation of repayment.

[Question] According to which principles is the distribution made?

[Answer] Primarily on the basis of research, on the risk inherent in the development, and its potential usefulness. If we give money for a project from which the recipient will forseeably profit, we ask for repayment. In cases where the development promises to be profitable, we simply transmit the money to our common bank, and then the bank loans it to the enterprise with a rate of interest of 7-14 percent. In some cases an enterprise may make a profit but it is passed on to other companies--then we don't require repayment.

[Question] How well founded are these decisions?

[Answer] We could talk equally well about lots of successes and lots of failures. Keeping only profits in mind is no way to approach technical development over the long term. It is our task to think for the long term, but newly the economic situation of the country has forced us to put more emphasis on development projects with a quicker return.

[Question] Understandably, it is not appropriate to base a verdict of the distribution of technical development funds on short-term results. Still, the question arises, are there guarantees for the correctness of the selection decision.

[Answer] In terms of selection and its control, our situation is now better than ever before, because we can now spend the money on well-developed goals, in a more concentrated fashion. Ten-fifteen years ago the practice was that enterprises and research institutes, having taken into consideration the developments in the world, would make suggestions as to what they wanted to spend money on. The OMFB would then judge the applications that were arriving by the hundreds, and accepted about a third or a fourth, if it found that the particular projects advanced the process of technical development. Just for the record, I want to note that even then we were giving the enterprises monies with repayment obligations. Certain groups even complained about this practice. Cuurently, the Law of the Plan, the science policy guidlines and the State Intermediate Range Research Development Plan decide where the money should be spent primarily.

[Question] Primarily or exclusively?

[Answer] Primarily.

[Question] How significant is the role of the OMFB in the development of the research programs?

[Answer] Now as before, our role is important. Earlier, the practice was to make recommendations alone or in conjunction with institutions and ministries, then the Science Policy Council or other government agency would make the final decision. Now we collect the recommendations of other ministries and state agencies, then the president of the OMFB selects and submits the research and development plan to the government. Inhcluded in the plan are those programs for which we alone are responsible, such as the

"electronization" program, or the program to develop materials-conserving technologies.

[Question] After all, on what basis can it be judged whether the OMFB is working well or not?

[Answer] The basis of judgement can only be, if it is said 5-10-15 years from now that we have supported development and programs which have been useful to the national economy and from which the costs of the investment have been recovered. Let me cite an example. The domestic computer technology program started in the seventies. If at that time we would have insisted that there was no need for it, we would have been wrong. But under the actual conditions the planning and coordination of the OMFB and its work in the establishment of institutes has contributed significantly to Hungarian technical development.

[Question] That is true, but there is another side to it. It seems that the establishment of computer technology was possible only at the cost of serious blood-letting. The ground was not prepared suitably, in many places computers were treated as status symbols, and the imported machines were not adapted to each other. This caused losses in the billions for the country.

[Answer] This is not my area, and I do not know enough about it to make a judgement. Obviously, the establishment of this program was not perfect. The enterprises and the ministries could have miscalculated, and the OMFB could have made mistakes. It is easy to say, in retrospect, that it could have been organized better. I must add, however, that this was a huge effort and while there might have been peripheral mistakes, there were also epoch-making results. To show you that I am not biased, I will mention that, in my opinion, we are also responsible for the deplorable state of telephone communications. With our present jurisdiction, perhaps we could have imposed our opinion 10-15 years ago, which at the time was articulated only by stating that the question of the telephone network was not given sufficient emphasis in the list of priorities.

[Question] How real is the possibility that the above-mentioned mistakes can be repeated in different areas in the eighties?

[Answer] The chance of this happening is much smaller now than ever. The programs and priorities are accepted only after significantly more thorough analysis. Acceptance is legally binding, meaning that the whole apparatus of the state must aid this process.

[Question] What does your changed position mean for your interaction with the ministries?

[Answer] In the past, there was a separate organization for our cooperative effort for technical development; this was the Council for Coordinating Technical Research. Its task was to pay attention to the relative importance of the plans for technical development and to eliminate parallel efforts; in other words, to assure that all institutions use their resources effectively and for appropriate goals.

[Question] Did the decisions made there have binding power on the participants?

[Answer] No, the ministries submitted their own research and development programs on the basis of the concensus achieved. If approved, these became legally binding.

[Question] And if a ministry did not pay attention to the agreement?

[Answer] Then the OMFB could not do anything other than to turn to the Government Council.

Q. How is the situation different now?

A. The above-mentioned council has seized to exist and the OMFB has worked out the national economic priorities.

[Question] Is there no coordination on the ministry or branch level?

[Answer] Of course, there is. They send their recommendations and we consider their opinion, then our recommendation is reviewed by the government.

[Question] If my suspicions are right, the situation has changed. In the past the branch ministries could ignore the point of view of the OMFB, now it can select from the recommendations of the branches.

[Answer] That is the situation, by and large.

[Question] Does the present mechanism make for sounder decisions, in your opinion?

[Answer] Without a question. In the past, the principle governing thinking was for the OMFB to support the outstanding results of technical development. In this spirit, we selected from among the requests for development we received.

[Question] Did the danger exist that this mechanism might overemphasize informal connections when making decisions?

[Answer] Such forces could have operated in the past. We have discussed this ourselves. Since the selection of development goals is now on a firmer basis, the danger has decreased.

[Question] As the organization responsible for technical development, how do you see the trend towards falling behind in technical progress that seems to characterize the Hungarian economy in the last few years?

[Answer] I would rather emphasize that with our present jurisdiction we can influence this trend more effectively. In the past, the OMFB had much lesser legal rights.

[Question] How can the position of the OMFB be ranked by international comparison?

[Answer] There is a similar organization in every Socialist state which, by the way, has greater jurisdiction than ours. For example, in the Soviet Union the director of the state council for research and development has the rank of a deputy minister. In the German Democratic Republic and in Czechoslovakia there is a ministry for development and investments. Even in the capitalist countries there is a trend to set up a functional ministry for technical development.

[Question] According to you, what is the background of the present increase in the jurisdiction of the OMFB?

[Answer] I believe that the economic circumstances forced the decision upon us. The government has recognized this and has, along with other moves, taken steps to strengthen and modernize the direction of research and development by the state. Research and development that is properly aimed can do much to give a boost to the economy. This, however, must be guaranteed by institutions as well. A few years ago there was a major debate about whether one should leave the selection and support of technical development to market forces alone. Even the need for OMFB was questioned. The issue has since been decided. One can, and must, separate the technical development decisions of the enterprises which are based on market forces and short-term goals--and often market forces don't furnish enough information for well-founded decisions--from the long-term goals which are important for the economy of the country, but which do not appear on the everyday level. The increase in the juridiction of the OMFB was granted in the spirit of this recognition.

Table 1

The structure of the OMFB

Plenum: 40 members. Appointed by the deputy president of the MT. Task: make recommendations for the government.

Bureau: 166 members, the president of the OMFB under the direction of a personnel officer.

Under the Bureau are the

Executive advising bodies

1. Conference of directors--operative decisions such as support from the MUFA

2. Presidential College (22 members)--strategic decisions such as development programs

Deputy presidents

1. Offices such as Systems Analysis, Industrial Form Design, Corrosion Protection, Electronization

2. Main departments such as Executive Main Departmant, Research and Development Main Department

3. Specialized secretariats such as Energetics, Chemical, Metallurgical, Machine-industry

Other organizations under the direction of the OMFB

1. Materials Transporting and Packaging Institute
2. Computer Technology Research Institute
3. National Technical and Information Center.

Table 2

The Share of the OMFB from the Technical Development Fund

The OMFB has received more than one-third of the total sum during the Sixth 5-Year Plan (1981-85)

In 1981	1.9 billion forints
1982	2.1 billion forints
1983	1.6 billion forints
1984	1.8 billion forints
1985	2.0 billion forints

Together 9.4 billion forints

In the Seventh 5-Year Plan the share of the OMFB from the centralized MUFA will change to about 30 percent, or about 10 billion forints.

The expenses of the OMFB office itself are 60 million forints per year.

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